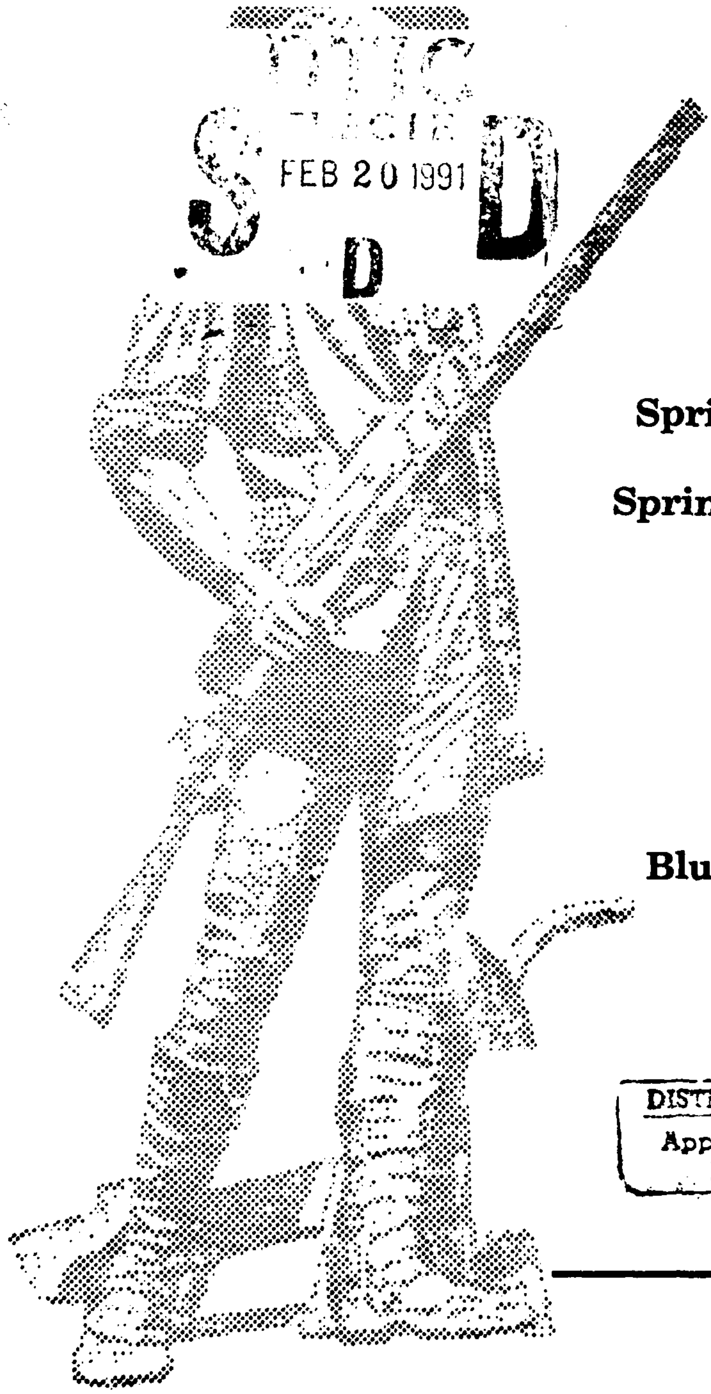
INSTALLATION RESTORATION PROGRAM



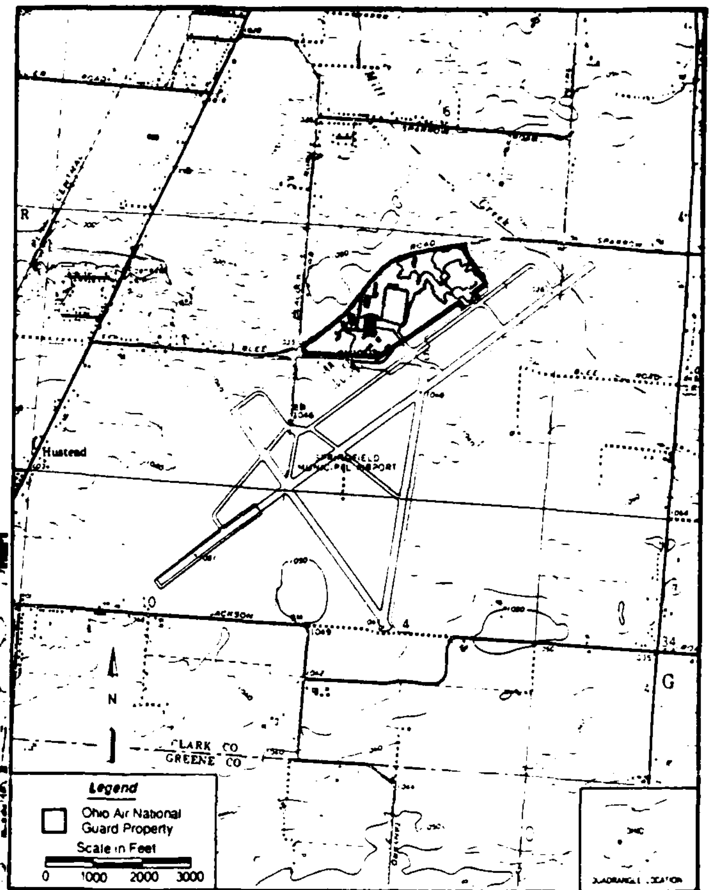
Preliminary Assessment

Springfield Air National Guard Base
Ohio Air National Guard
Springfield-Beckley Municipal Airport
Springfield, Ohio

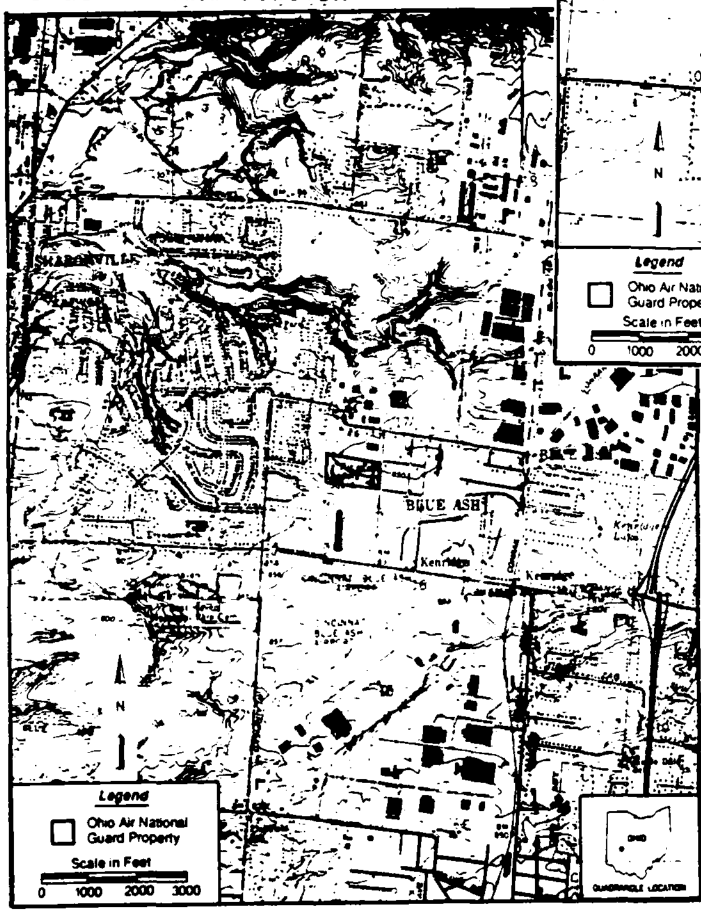
and

Blue Ash Air National Guard Station
Ohio Air National Guard
Cincinnati, Ohio

Hazardous Materials Technical Center
October 1988



Blue Ash ANG Station



Springfield ANG Base

This report has been prepared for the National Guard Bureau, Andrews Air Force Base, Maryland by the Hazardous Materials Technical Center for the purpose of aiding in the implementation of the Air Force Installation Restoration Program.

DISTRIBUTION: Approved for public release; distribution is unlimited.

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE October 1988	3. REPORT TYPE AND DATES COVERED Final Preliminary Assessment

4. TITLE AND SUBTITLE Installation Restoration Program Preliminary Assessment Springfield Air National Guard Base, Ohio Air National Gd. Springfield Bueckley Municipal Airport, Springfield, OH Blue Ash Air National Guard Station Ohio Air National Guard, Cincinati, Ohio	5. FUNDING NUMBERS
6. AUTHOR(S) N/A	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Hazardous Materials Technical Canter The Dynamac Building 11140 Rockville Pike Rockville, Maryland 20852	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES) Air National Guard Bureau Andrews Air Force Base, Maryland 20310	10. SPONSORING/MONITORING AGENCY REPORT NUMBER
11. SUPPLEMENTARY NOTES	
12a. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release distribution is unlimited	12b. DISTRIBUTION CODE

13. ABSTRACT (Maximum 200 words)

Preliminary Assessment on suspect hazardous waste sites on Springfield Air National Guard Base and Blus Ash Air National Guard Station under the Air National Guard Bureau's Installation Restoration Program.

14. SUBJECT TERMS Installation Restoration Program Preliminary Assessment Ohio Air National Guard	15. NUMBER OF PAGES
	16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT

INSTALLATION RESTORATION PROGRAM
PRELIMINARY ASSESSMENT

FOR

SPRINGFIELD AIR NATIONAL GUARD BASE
OHIO AIR NATIONAL GUARD
SPRINGFIELD-BECKLEY MUNICIPAL AIRPORT
SPRINGFIELD, OHIO

and

BLUE ASH AIR NATIONAL GUARD STATION
OHIO AIR NATIONAL GUARD
CINCINNATI, OHIO

December 1988

Prepared for

National Guard Bureau
Andrews Air Force Base, Maryland 20310

Prepared by

Hazardous Materials Technical Center
The Dynamac Building
11140 Rockville Pike
Rockville, Maryland 20852

Contract No. DLA 900-82-C-4426

TABLE OF CONTENTS

APPENDICES

LIST OF FIGURES

LIST OF FIGURES (Continued)

LIST OF TABLES

EXECUTIVE SUMMARY

A. Introduction

The Hazardous Materials Technical Center (HMTC) was retained in March 1988 to conduct the Installation Restoration Program (IRP) Preliminary Assessment (PA) of the Springfield Air National Guard, Ohio Air National Guard, Springfield-Beckley Municipal Airport, Springfield, Ohio, (hereinafter referred to as the Base), and the Blue Ash Air National Guard Station, Ohio Air National Guard, Blue Ash ANG Station, Cincinnati, Ohio (hereinafter referred to as the Station). The primary unit at the Base is the 178th Tactical Fighter Group (178 TFG). Tenants include the 251st Combat Communications Group (251 CCG) and one of its squadrons, the 269th Combat Communications Squadron (269 CCG). The Station's primary unit is the 123rd Tactical Control Flight (123 TCF). A tenant unit includes the 124th Tactical Control Flight (124 TCF). The IRP PA is being performed under Contract No. DLA-900-82-C-4426. The Preliminary Assessment included:

- o an onsite visit, including interviews with 19 past and present Base employees and three present Station employees conducted by HMTC personnel during 14-18 March 1988;
- o the acquisition and analysis of pertinent information and records on hazardous material use and hazardous waste generation and disposal at the Base;
- o the acquisition and analysis of available geologic, hydrologic, meteorologic, and environmental data from pertinent Federal, State, and local agencies; and
- o the identification of sites on the Base and Station that are potentially contaminated with hazardous materials/hazardous wastes (HM/HW).

B. Major Findings

BASE:

Past Base operations involved the use and disposal of materials and wastes that were subsequently categorized as hazardous. The Base shops that use and dispose of HM/HW include Aircraft Maintenance; Vehicle Maintenance; Facilities Maintenance; Petroleum, Oil, and Lubricants (POL) Management; Photography Processing; Corrosion Control; Aerospace Ground Equipment (AGE); and Nondestructive Inspection (NDI). Waste oils, paint, solvent, thinner, fuel, methyl ethyl ketone (MEK), battery acid, batteries, ethylene glycol, photographic chemicals, radiation source tubes, PD-680, carbon remover, varsol, engine fluids, and carburator cleaner are generated by these activities.

Interviews with past and present Base personnel, and a field survey resulted in the identification of disposal and/or spill sites at the Base that are potentially contaminated with HM/HW. These sites were assigned a Hazard Assessment Score (HAS) according to the U.S. Air Force Hazard Ranking Methodology (HARM).

Site No. 1 - Fire Training Area 1 (HAS-79)

The first Fire Training Area (FTA) used by the Base was located behind the Avionics Building. It was in operation from 1957 to 1963. The standard procedure was to float the fuel on water, ignite the fuel, extinguish the fuel and relight for a 70 percent burn.

Site No. 2 - Fire Training Area 2 (HAS-79)

A second FTA was in operation from 1967 until 1982. The Base has been the sole operator of the FTA. The Fire Department burned JP-4 and any ignitables in the area. Standard procedure was to float the fuel on water, ignite the fuel, extinguish the fuel, and relight for a 70 percent burn. The FTA was used four times per year, using approximately 1,000 to 1,500 gallons of fuel per burn.

Site No. 3 - Leach Field and Outfall (HAS-63)

The Base sewer system consisted of an oil water separator (OWS) in which the OWS effluent went to the sanitary sewer system which consisted of a septic tank. Another OWS drained into the storm sewer which went to the sand filter. Waste oils, solvents, battery acid, and photographic chemicals, ethylene glycol (antifreeze), cleaner, degreaser, and fuel were disposed of through the sewer system from the 1950s to 1988. The Base is now on the city sewer system; however, the leach field and outfall remain.

Site No. 4 - POL Spill (HAS-59)

In 1972, 1,000 gallons of JP-4 were released when a refueling valve failed at the POL facility. The fuel drained to a ditch off-Base along the road, migrated 1-1/2 miles to an adjacent farm property, and killed ducks and fish in a pond. Since the incident, the State has excavated the soil as part of maintenance regrading, therefore, the only potentially contaminated soil is at the POL facility.

Site No. 5 - Ramp Drainage Ditch (HAS-59)

Drainage from the aircraft parking ramp flows north and out into an outfall. This water consolidates with other storm waters from the Base. During the site visit, an oily sheen was noticed along the drainage path on the west side of the ramp.

Site No. 6 - Mess Hall Underground Storage Tank Oil Spill (HAS-59)

In 1987, the Mess Hall Underground Storage Tank (UST) was replaced. About 40 gallons of heating oil was spilled during removal operations between the building and the fenceline next to the building. The tank was removed due to the tank taking in water. No outward leakage was detected on the ground where the tank was during removal operations.

STATION:

Past Station operations involved the use and disposal of materials and wastes that were subsequently catagorized as hazardous. The major operations of the Station that use and dispose of the HM/HW include Aerospace Ground Equipment (AGE), Field Maintenance and Vehicle Maintenance. Waste engine oil, sulfuric acid, ethylene glycol, hydraulic oil, transmission fluid, paint thinner, brake fluid, grease, paint, carbon removing compound and cutting fluid are generated by these activities.

Interviews with present Station personnel and a field survey resulted in the identification disposal and/or spill sites at the Station that are potentially contaminated with HM/HW. These sites were assigned a HAS according to the U.S. Air Force HARM.

Site No. 7 - Diesel Fuel Spill (HAS-55)

A 200-gallon diesel fuel spill occurred about the winter of 1983 at the end of the AGE shop. The fuel drained from the building, through a swale and off Station property. The land has been regraded since then for a road to a parking area. There was no cleanup effort made.

Site No. 8 - Leach Field (HAS-53)

The Station's sanitary sewer system consists of two OWSs which drain to a leach field, located off Station property. The OWSs are located at AGE and Vehicle Maintenance.

C. Conclusions

BASE:

Information obtained through interviews with past and present Base personnel resulted in the identification of six areas on the Base that are potentially

contaminated with HM/HW. At all of the identified sites, the potential exists for contamination of soils, surface water, or groundwater and subsequent contaminant migration. Each of these sites was therefore assigned a HAS according to HARM.

STATION:

Information obtained through interviews with present Station personnel resulted in the identification of two areas on the Station that are potentially contaminated with HM/HW. At all of the identified sites, the potential exists for contamination of soils, surface water or groundwater, and subsequent contamination migration. Each of these sites was therefore assigned a HAS according the HARM.

D. Recommendations

BASE:

Because of the potential for contamination of soils, groundwater, and surface water at the Base, and migration of contaminants to off-Base receptors, each of the scored sites should be further investigated in accordance with applicable regulations.

STATION:

Because of the potential for contamination of soils, groundwater, and surface water at the Station, and migration of contaminants to off-Station receptors, each of the scored sites should be further investigated in accordance with applicable regulations.

I. INTRODUCTION

A. Background

The Ohio Air National Guard (ANG) at the Springfield-Beckley Municipal Airport, Springfield, Ohio (hereinafter referred to as the Base) supports the 178th Tactical Fighter Group. The Base operates a satellite station, the 123rd Tactical Control Flight located at the Blue Ash ANG Station, Cincinnati, Ohio (hereinafter referred to as the Station). The Base provides A-7 aircraft for combat and the Station provides aircraft tracking services. Past operations at the Base and Station involved the use and disposal of materials and wastes that subsequently were categorized as hazardous. Consequently, the National Guard Bureau has implemented its Installation Restoration Program (IRP). The IRP consists of the following:

- o Preliminary Assessment (PA) - to identify past spill or disposal sites posing a potential and/or actual hazard to public health or the environment.
- o Site Investigation/Remedial Investigation/Feasibility Study (SI/RI/FS) - to acquire data via field studies, for the confirmation and quantification of environmental contamination that may have an adverse impact on public health or the environment and to select a remedial action through preparation of a feasibility study.
- o Research, Development and Demonstration (RD & D) - if needed, to develop new technology for accomplishment of remediation.
- o Remedial Design/Remedial Action (RD/RA) - to prepare designs and specifications and to implement site remedial action.

B. Purpose

The purpose of this Preliminary Assessment is to identify and evaluate suspected problems associated with past hazardous waste/hazardous materials (HW/HM) handling procedures, disposal sites, and spill sites on the Base and Station. Personnel from the Hazardous Materials Technical Center (HMTC) visited

the Base and Station, reviewed existing environmental information, analyzed Base and Station records concerning the use and generation of HM/HW, and conducted interviews with past and present Base and Station personnel familiar with past HM/HW activities.

A physical inspection was made of the suspected sites. Relevant information collected and analyzed as a part of the Preliminary Assessment included the history of the Base and Station, with special emphasis on the history of the shop operations and their past HM/HW management procedures; local geological, hydrological, and meteorological conditions that may affect migration of contaminants; local land use, and public utilities that could affect the potential for exposure to contaminants; and the ecological settings that indicate environmentally sensitive habitats or evidence of environmental stress.

C. Scope

The scope of this Preliminary Assessment is limited to operations at the Base and Station and includes:

- An onsite visit;
- The acquisition of pertinent information and records on hazardous materials use and hazardous wastes generation and disposal practices at the Base and Station;
- The acquisition of available geological, hydrological, meteorological, land use, critical habitat, and utility data from various Federal, State, and local agencies;
- A review and analysis of all information obtained; and
- The preparation of a report to include recommendations for further actions.

The onsite visit and interviews with past and present Base and Station personnel were conducted during the period 14-18 March 1988. The Preliminary Assessment was conducted by Ms. Natasha Brock, Task Manager/Environmental Scientist; Dr. Naichia Yeh, Ph.D., Environmental Scientist; Ms. Betsy Briggs, Hazardous Waste Specialist; and Mr. Raymond Clark, P.E./Department Manager.

Other HMTC personnel who assisted with the Preliminary Assessment include Mr. Mark Johnson, P.G./Program Manager. Personnel from the Air National Guard Support Center who assisted in the Preliminary Assessment included Mr. Daniel Waltz, Project Officer. The Point of Contact (POC) at the Base was Maj. Homer Smith, Base Civil Engineer. The POC at the Station was Lt. Col. Shelburn Childers, Station Commander.

D. Methodology

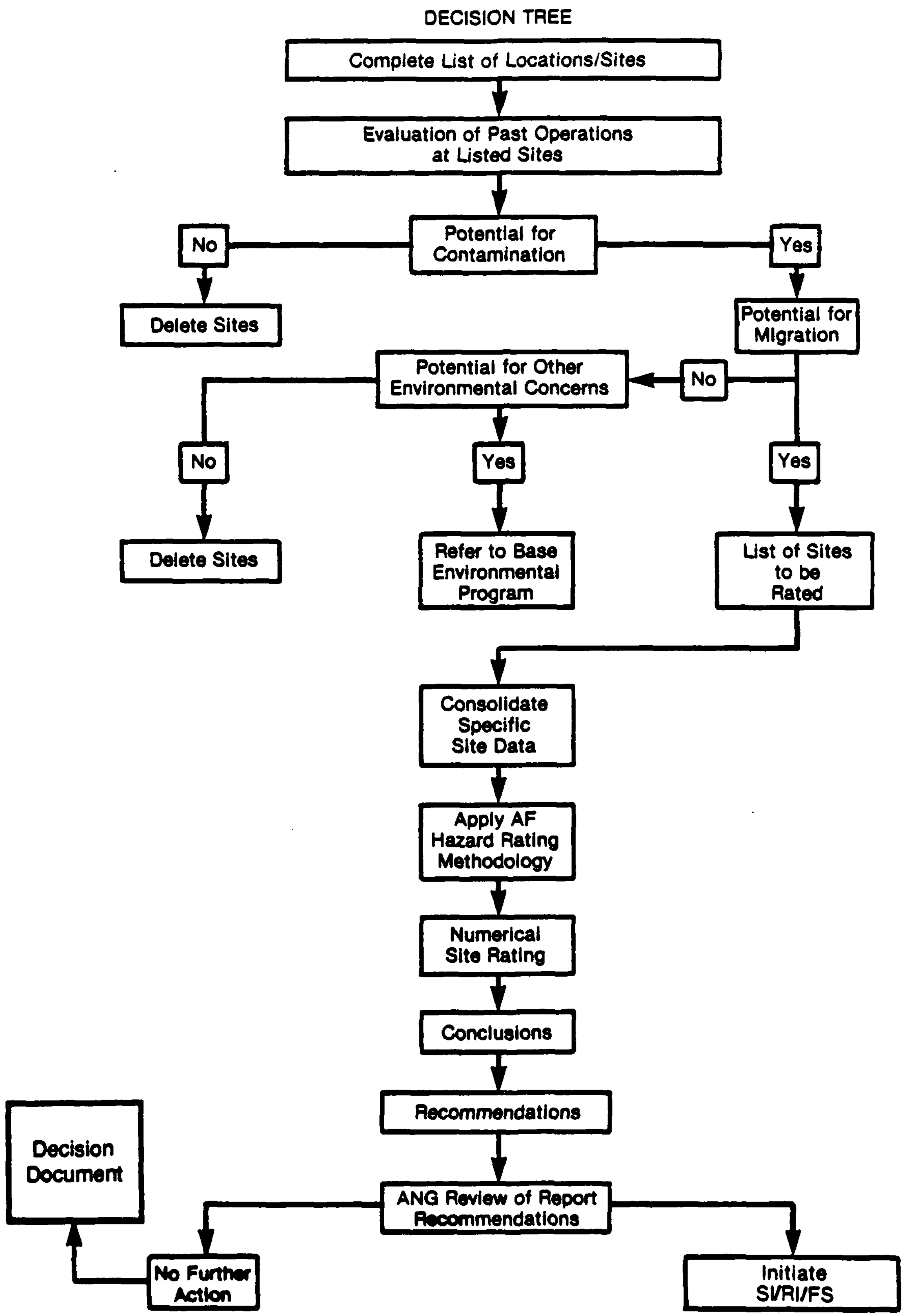
A flow chart of the Preliminary Assessment Methodology is presented in Figure 1. This methodology ensures a comprehensive collection and review of pertinent site-specific information and is used in the identification and assessment of potentially contaminated hazardous waste spill/disposal sites.

The Preliminary Assessment begins with a site visit to the Base and Station to identify all shop operations or activities on the installation that may use hazardous materials or generate hazardous wastes. Next, an evaluation of both past and present HM/HW handling procedures is made to determine whether any environmental contamination has occurred. The evaluation of past HM/HW handling practices is facilitated by extensive interviews with past and present employees familiar with the various operating procedures at the Base and Station. These interviews also define the areas on the Base and Station where any HM/HW, either intentionally or inadvertently, may have been used, spilled, stored, disposed of, or otherwise released into the environment.

Historic records contained in the Base and Station files are collected and reviewed to supplement the information obtained from interviews. Using this information, a list of past waste spill/disposal sites on the Base and Station is identified for further evaluation. A general survey tour of the identified spill/disposal sites, the Base and Station, and the surrounding area is conducted to determine the presence of visible contamination and to help assess the potential for contaminant migration. Particular attention is given to locating nearby drainage ditches, surface water bodies, residences, and wells.

Figure 1.

Preliminary Assessment Methodology Flow Chart.



Detailed geologic, hydrologic, meteorologic, land use and environmental data for the area of study is also obtained from the POC, and from appropriate Federal, State, and local agencies. A list of outside agencies contacted is in Appendix B. Following a detailed analysis of all the information obtained, areas are identified as suspect areas where HM/HW disposal may have occurred. Where sufficient information is available, sites are assigned a Hazard Assessment Score (HAS) using the U.S. Air Force Hazard Assessment Rating Methodology (HARM) (Appendix C). However, the absence of a HAS does not necessarily negate a recommendation for further IRP investigation, but rather may indicate a lack of data. The HAS is computed from the data included in the Factor Rating Criteria. (Appendix D).

II. INSTALLATION DESCRIPTION

A. Location

BASE:

The Base is located at the Springfield-Beckley Municipal Airport which is located in Clark County, south of the city of Springfield (see Figure 2A), in Greene Township, specifically township 4, range 8, section 5. The airport is bordered by Mill Creek to the northeast. The land around the Base is agricultural with homes along Peacock Road, and Sparrow Road. Population within a 1-mile radius of the Base is calculated by using the Clifton, Ohio Quadrangle Topographic Map, 1974, (to count residential property) and assuming each dwelling unit has 3.8 residents (47 FR 31233). The residential population is 247 and the Base personnel population is 313, therefore, the total population is 560. Figure 2B shows the location and boundary of the Base covered in this Preliminary Assessment.

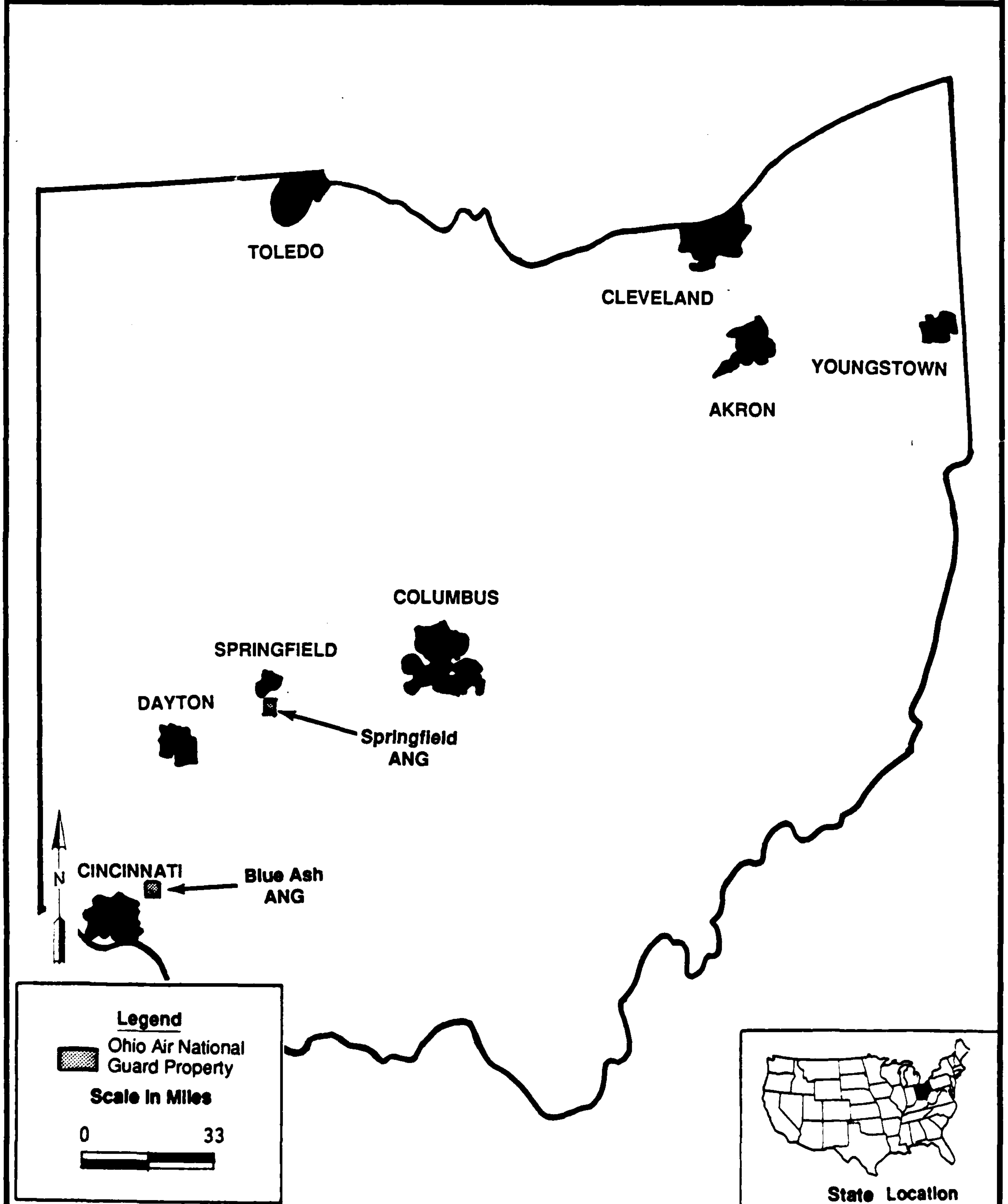
STATION:

Approximately 50 miles to the southwest of the Base in Hamilton County, the city of Blue Ash, is the Station (see Figure 2A). The technical designation is township 3, range 1, section 17. The Cincinnati-Blue Ash Airport is located about 1/2 mile south of the Station, on Pfeiffer Road. A residential area is located to the west of the Station, immediately adjacent to the property line. To the north are light industry/commercial buildings. On the east side of the Station sparse residences are found. Population within a 1-mile radius of the Station is calculated by using the East Cincinnati 1981, Glendale 1982, Maderia, 1982 and Mason, 1981 Quadrangle Topographical maps (to count residential property) and assuming each dwelling unit has 3.8 residents (47 FR 31233). The residential population is 3,023 and the Station personnel populations is 33, therefore, giving a total population of 3,061. Figure 2C shows the location and boundary of the Station covered in this Preliminary Assessment.

HMTC Source: Interstate Road Atlas, 1984.

Figure 2A.

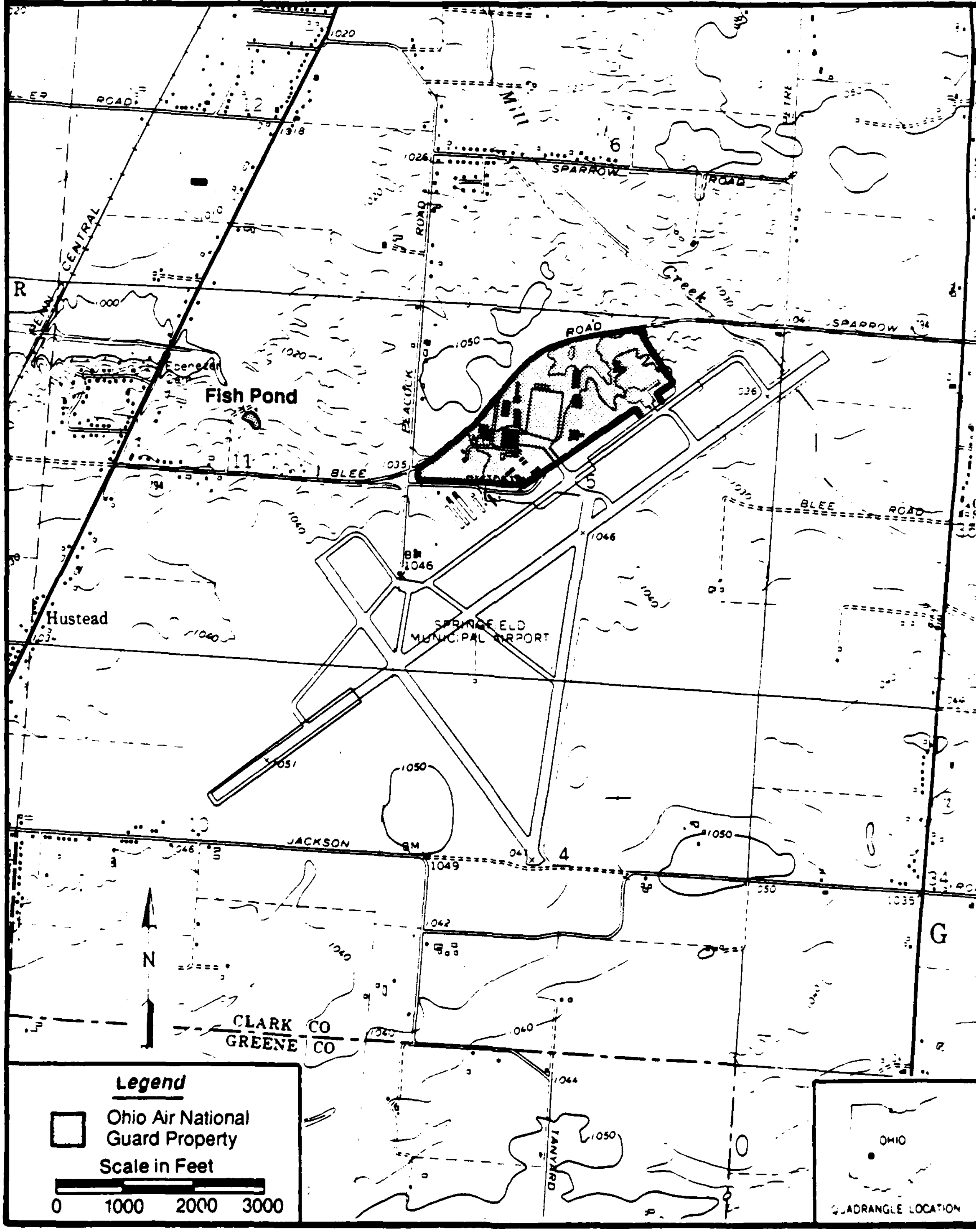
Location Map of the Springfield and Blue Ash Air National Guards.



Source: U.S.G.S. 7.5 minute
Series Clifton, Ohio 1968
Photorevised 1974.

Figure 2B.

Location Map of the Ohio Air National Guard, Springfield–Beckley Municipal Airport, Springfield, Ohio.

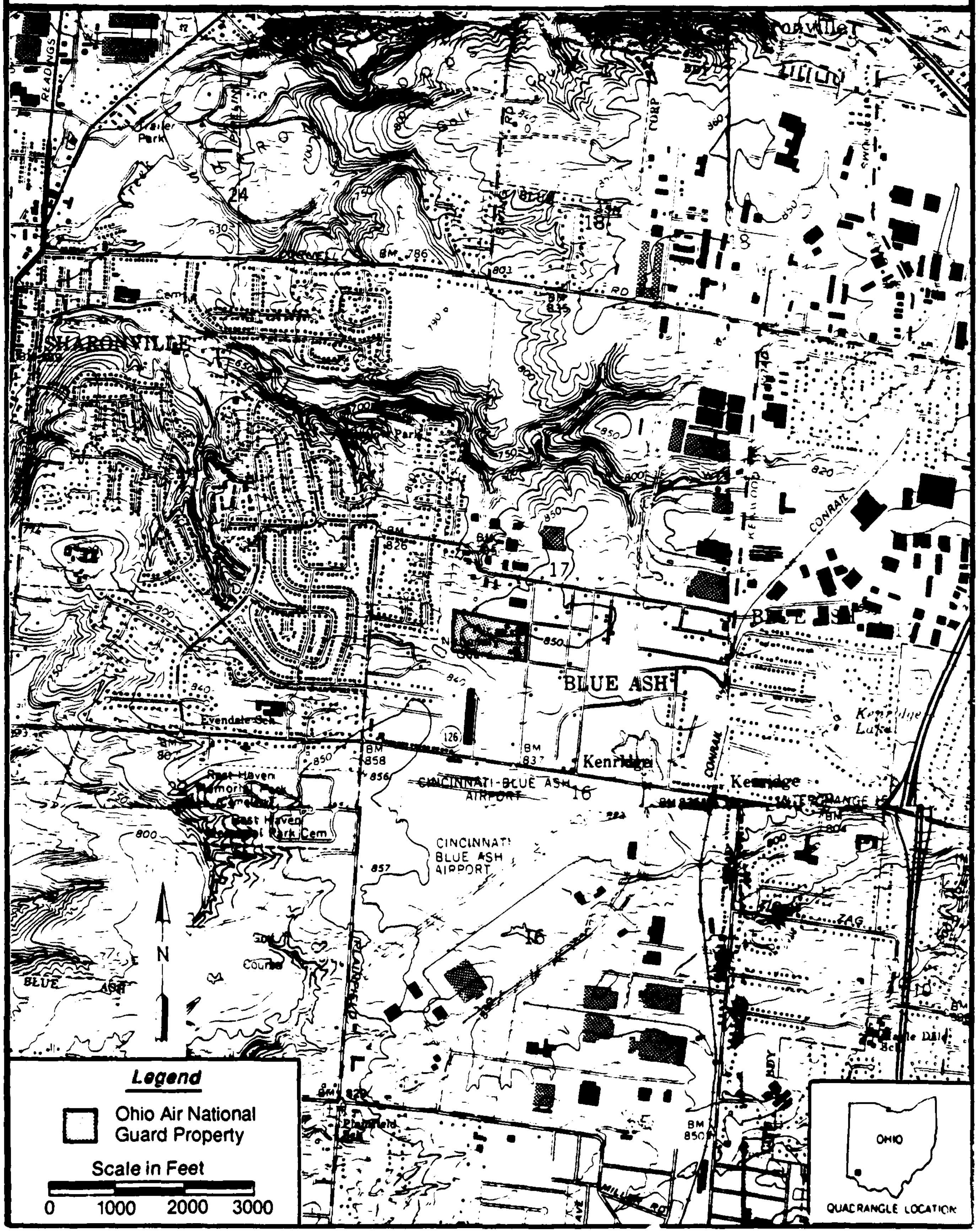


HMTC

Source: U.S.G.S. 7.5 minute Series, Cincinnati East, 1961
Photorevised 1981, Glendale 1965
Photorevised 1982, Maderia 1961
Photorevised 1982, Mason 1965
Photorevised 1981.

Figure 2C.

Location Map of the Ohio Air National Guard, Blue Ash ANG Station, Cincinnati, Ohio.



B. History of Base Operations

BASE:

The Springfield Ohio Air National Guard was established in 1951 and the 605th Signal Light Construction Company was organized. In 1952 the 605th was converted to the present 269th Communications Squadron.

In 1955, facilities were built to house the 162nd Tactical Fighter Squadron at the Springfield Airport; unable to build at the Dayton Airport due to facility differences.

In the fall of 1955, the 162nd moved its flight operation to Springfield.

Currently, the Base host, or primary unit, is the 178th Tactical Fighter Group (178 TFG), an ANG tactical fighter group, flying the A-7D/K aircraft. Tenant units include the 251st Combat Communications Group (251 CCG) and one of its squadrons, the 269th Combat Communications Group (269 CCG). Air traffic control, navigational aid maintenance, communications and weather support are provided by tenant detachments of Wright-Patterson AFB (WPAFB) units located 10 miles to the west.

STATION:

The Blue Ash Ohio Air National Guard was activated in March 1948 as the 123rd AC&W Squadron, and was located at Lunken Airport until December 1951. The squadron was moved to Donaldson AFB, South Carolina from December 1951 until October 1952 and to Ulm, Germany from October 1952 until November 1953. From November 1951 until October 1953, the squadron's operation consisted of the Korean Conflict.

On November 1953, the unit moved to its present location at the Blue Ash ANG Station.

During the Berlin Crisis, October 1961 until October 1962, the unit was located in Landshut, Germany.

The Station host unit is the 123rd Tactical Control Flight (123 TCF), an ANG mobile, tactical radar unit. One tenant unit, the 124th Tactical Control Flight (124 TCF), is located at the Station. The 178 TFG, Base, provides a multitude of support services to the Station, as does WPAFB, under host-tenant agreements, etc.

III. ENVIRONMENTAL SETTING

A. Meteorology

SPRINGFIELD:

The climate of the Springfield (Dayton) area is humid temperate with precipitation occurring evenly throughout the year. The mean annual temperature is 52.7°F, with summer months averaging in the high 70s and winter averaging in the low 30s.

The annual precipitation consists of 36.75 inches of rainfall. By calculating the net precipitation according to the method outlined in the Federal Register (47 FR 31224), a net precipitation value of 5 inches per year is obtained. This value is obtained by subtracting the mean lake evaporation (32 inches) from the normal annual total precipitation (37 inches). Maximum rainfall intensity, based on a 1-year, 24-hour rainfall, is 2.5 inches (47 FR 31235). This value is obtained from Figure 8 in the Federal Register.

BLUE ASH:

The climate of the Blue Ash (Cincinnati) area is humid temperate. The area precipitation is the same throughout the year but generally above average in March, April, and May, and below average in September, October, and November. The average temperature in January is 32°F and 77°F in July.

The annual precipitation consists of 38.55 inches of rainfall. By calculating the net precipitation according to the method outlined in the Federal Register (47 FR 31224), a net precipitation value of 5 inches per year is obtained. This value is obtained by subtracting the mean annual lake evaporation (34 inches) from the normal annual total precipitation (39 inches). Maximum rainfall intensity, based on a 1-year, 24-hour rainfall, is 2.0 inches (47 FR 31235). This value is obtained from Figure 8 in the Federal Register.

B. Geology

SPRINGFIELD:

Topographically, the Base and airport are situated on a plateau with a slight rise in elevation to the northwest. To the east, south and west, the elevation drops very slowly. The area has no more than 20 feet elevational change.

The Base is predominantly underlain by three major geological formations of unequal thickness which are part of the Till Plains section of the Central Lowlands physiographic province. There is a slight inclination of the strata towards the north.

The Base location is very close to the lowest elevation in the county, the valley of the Mad River, which is in the southwestern corner of Mad River Township. Taking this lowest level as the floor, the whole county is built up of the Richmond/Maysfield/Eden Series, Brassfield Limestone and the Niagaran Series, which consists of the Dayton Limestone, Osgood Shale, Laurel Dolomite, Massie Shale, Euphemia Dolomite, Springfield Limestone and Cedarville Limestone, all with a combined thickness of approximately 100 feet. These formations are of Silurian Age (see Figures 3A and 3B).

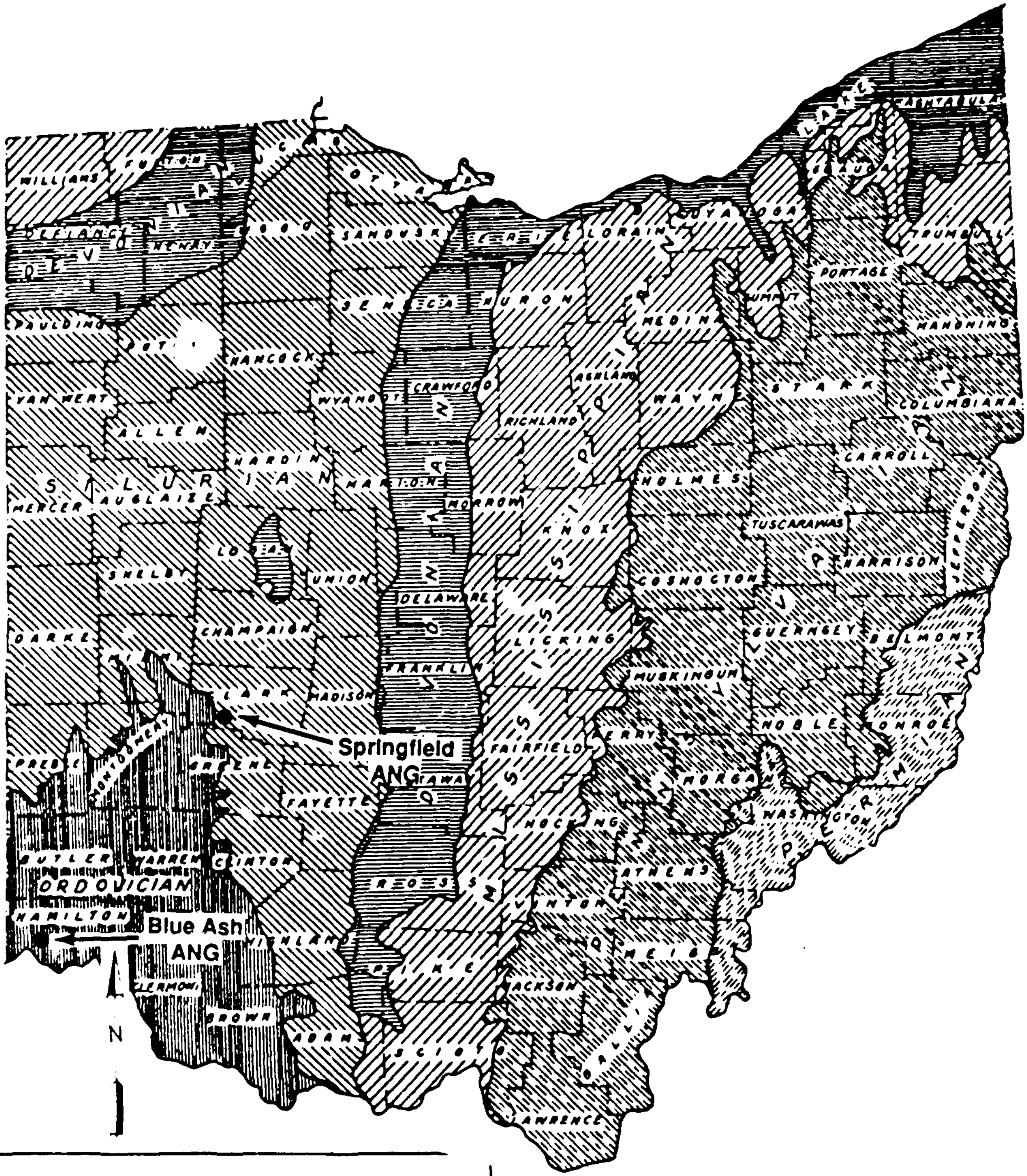
The Richmond/Maysfield/Eden Series consists of the Blue Limestone which is interstratified limestones and shales (Eden shales) of Ordovician Age at the bottom of the formation, or clays, highly fossiliferous, and which are rapidly weathered into fertile soil. The characteristics of this series are not prominently displayed because the surface of this layer is heavily covered with glacial drift or alluvial formations. The top portion of this series is marked by non-fossiliferous shales, 20 to 30 feet thick, often red from iron oxides. This feature marks the end of the Lower Silurian time.

The Brassfield Limestone enters the county in Mad River Township. It is an uneven bedded rock with a sandy texture in its lower portion and a semi-crystalline, crinoidal limestone in its upper beds. It ranges from 7 to 13

HMTC Source: Schmidt, 1982.

Figure 3A.

Geologic Map of Ohio.



Legend

Ordovician shales and limestones

Silurian limestones, shales, and dolomites

Scale in Miles

0 33

HMTC Source: Pree, 1965.

Figure 3B.

Stratigraphic and Hydrostratigraphic Units of Southwestern Ohio.

System	Series	Group or Formation	Thickness (ft.)	Character of Material	Water-bearing Characteristics
Quaternary	Recent		0-30	Alluvium, composed of clay, silt, sand, and gravel, deposited on the ~~flood~~ plains of the major river valleys.	Small to moderate water supplies from shallow dug or driven wells where material is coarse
Quaternary	Pleistocene		0-410	Interbedded gravels and sands deposited as outwash (stratified drift) in the buried valleys by glacial melt-waters.	Quantity of water available depends upon the sorting, thickness, and areal extent of the materials and the source of recharge, yields may exceed 1000 gpm.
Quaternary	Pleistocene		0-275	Till, a heterogeneous mixture of clay and gravel with variable amounts of sand.	Generally poor source of water, although moderate supplies may be obtained from lenses of sand and gravel.
Devonian		Olentangy	15-35	Blue, soft argillaceous shale, with some argillaceous limestone concretions.	Not a dependable source of water.
Devonian		Delaware	30-70	Thin-bedded, blue-gray limestone with some thin, shaly layers, pyrite and black chert, grading to rather massive layers of limestone.	Small supplies of water, generally less than 5 gpm.
Devonian		Columbus	70-125	Fairly massive, light gray to light brown, rather pure limestone grading to a rather porous, massive, impure limestone.	Potential yields range up to 200 gpm. Mineralization of water varies with location of well and increases with depth.
Devonian		Bass Island	500-650	Fine-grained, compact, thin to massive, impure, argillaceous limestone.	Most important bedrock source of industrial water supplies in eastern part of area. Yields up to 400 gpm or more. Water is usually highly mineralized.
Silurian	Niagaran	Cedarville limestone	50-100	Massive, porous dolomite.	Yields generally range from 5 to 25 gpm, although some wells produce 45 to 100 gpm. Water is very hard
Silurian	Niagaran	Springfield limestone	6-16	Well-bedded, dense dolomite	
Silurian	Niagaran	Euphemia dolomite	2-11	Massive, porous dolomite	
Silurian	Niagaran	Massie shale	5-6	Dense, calcareous clay shale.	
Silurian	Niagaran	Laurel dolomite	5-9	Thin-bedded, dense dolomite	
Silurian	Niagaran	Osgood shale	10-8[illegible]	Soft, gray, calcareous shale with limestone beds.	
Silurian	Niagaran	Dayton limestone	7-13	Thin-bedded, dense limestone.	
Silurian		Brassfield limestone	20-80	Massive to irregularly-bedded, fossiliferous limestone	
Ordovician	Richmond, Maysville, and Eden groups undifferentiated		600-1000	Soft, calcareous shale, interbedded with thin, hard limestone layers	Yields are generally less than 1 gpm. Water usually occurs in upper few feet of rocks. Water may contain large quantities of iron and hardness
Ordovician	Beds of pre-Eden age	So-called Trenton limestone of drillers	500-1150	Limestone or domomite with some shale.	May yield small quantities of water containing salt or hydrogen sulfide.

feet thick. The bulk is crystalline in structure and consequently resists the weathering action of the air better than the Blue Limestone layer. This layer varies in color from white, through various shades of yellow, pink, and red, to a dark brownish red, which contains a notable proportion of iron oxides. The Brassfield Limestone is quite uniform in its composition, consisting generally of 84 percent carbonate of lime and 10 to 12 percent carbonate of magnesia.

The Niagara Series is the most important division of the geological scale of the county as it is the thickest and covers a wider area. The elements of the Niagara Series in the county from the bottom to the top are: Dayton Limestone, Osgood Shale, Laurel Dolomite, Massie Shale, Euphemia Dolomite, Springfield Limestone, and Cedarville Limestone.

The bottom layer of the Niagaran Series is the Dayton Limestone which is a dense, compact, evenly bedded white dolomitic limestone ranging in thickness from 7 to 13 feet. The beds are thin and are separated by shale partings. The next layer, is the Osgood Shale, which consist of soft gray calcareous shales with limestone beds. The shales consist of a soft light blue impervious rock, which is locally called soapstone. The third member of the Niagaran Series, the Laurel Dolomite, is thinly bedded, bluish-gray in color, and approximately 5 to 9 feet thick. The fourth member is the Massie Shale which consists of a dense bluish-gray calcareous shale, 5 to 6 feet thick. It is separated from the Laurel dolomite by a spring zone. The Springfield Limestone is a dolostone and contains a small percentage of silica and alumia. The composition is not uniform. The prevailing color of this rock is light drab to the south of the State, however, the rock is mainly blue. The thickness of this formation is 6 to 16 feet. Cedarville Limestone is the fourth division and the thickest layer (42 feet in its vertical section) of the Niagara Series. There are two subdivisions in this group. The lower layer is a massive rock, semi-crystalline in texture and highly fossiliferous. Above this layer are thin, uneven-bedded limestones which are sandy and porous in texture and buff to light brown in color. Both of these subdivisions are united under a cap-rock within the limit of the City of Springfield. The cap-rock does not exceed 25 feet in thickness.

The unconsolidated material in Clark County consists of glacial till. Very little information exists on this area. The glacial till consists of clayey silt with pebbles and boulders. The Base sits on the highest part of the area surrounding the airport. The amount of glacial till is approximately 30 feet and the normal occurrence of surface sand and gravels is unlikely. The till is jointed both vertically and horizontally, however, the permeability of groundwater is low. The area also sits on a divide caused by the collision of two glaciers to the east of the Base, so the potential for clay units under the till is low (ODNR, Div. of Geol. Sur., 1988)

BLUE ASH:

The Station is located in the northeastern corner of Hamilton County. The topography surrounding the Station consists of a gentle sloping downwards from the Station on all sides. The elevational change is no more than 50 feet.

Hamilton County is divided into highland and lowland areas. The highlands of the county are the areas in which the bedded rock is found at an elevation of 200 feet to 500 feet or more above the Ohio River at Cincinnati. The Station is located in the center of the highland surrounded by the Little Miami River and the Mill Creek. All of these areas are covered with surficial glacial drift deposits and are underlaid by bedrock of Ordovician Age. The first formation consists of bedrock, which is the Richmond/Maysfield/Eden Series, and has been described in the Springfield geology section.

In this area, the Eden Shales are found mainly on the slopes of hills. This formation has a total thickness of 250 feet, and includes beds of limestone, soft shale, clay, or soapstone. The shales typically constitute 25 feet of the total thickness.

Beds of pre-Eden age cover 3/4 of the surface of the county. This series is a highly fossiliferous limestone and may contain some shale.

The lowland areas of the county are covered with deposits of glacial drift. These deposits are divided into two groups: the highland drifts and the lowland drifts.

The highland drifts originate from the decomposition of the Blue Limestone and contain rounded pebbles, thus distinguishing them from the native beds of limestone. Their thickness is usually less than 20 feet.

The lowland drifts are younger than the highland drifts and are classified into two divisions: the bottom lands, and the terraces or second bottoms.

These divisions are distinguishable by elevation and composition. The terraces are composed of gravel with occasional beds of sand and clay. The bottom lands contain all of these constituents with a greater proportion of fine materials.

C. Soils

SPRINGFIELD:

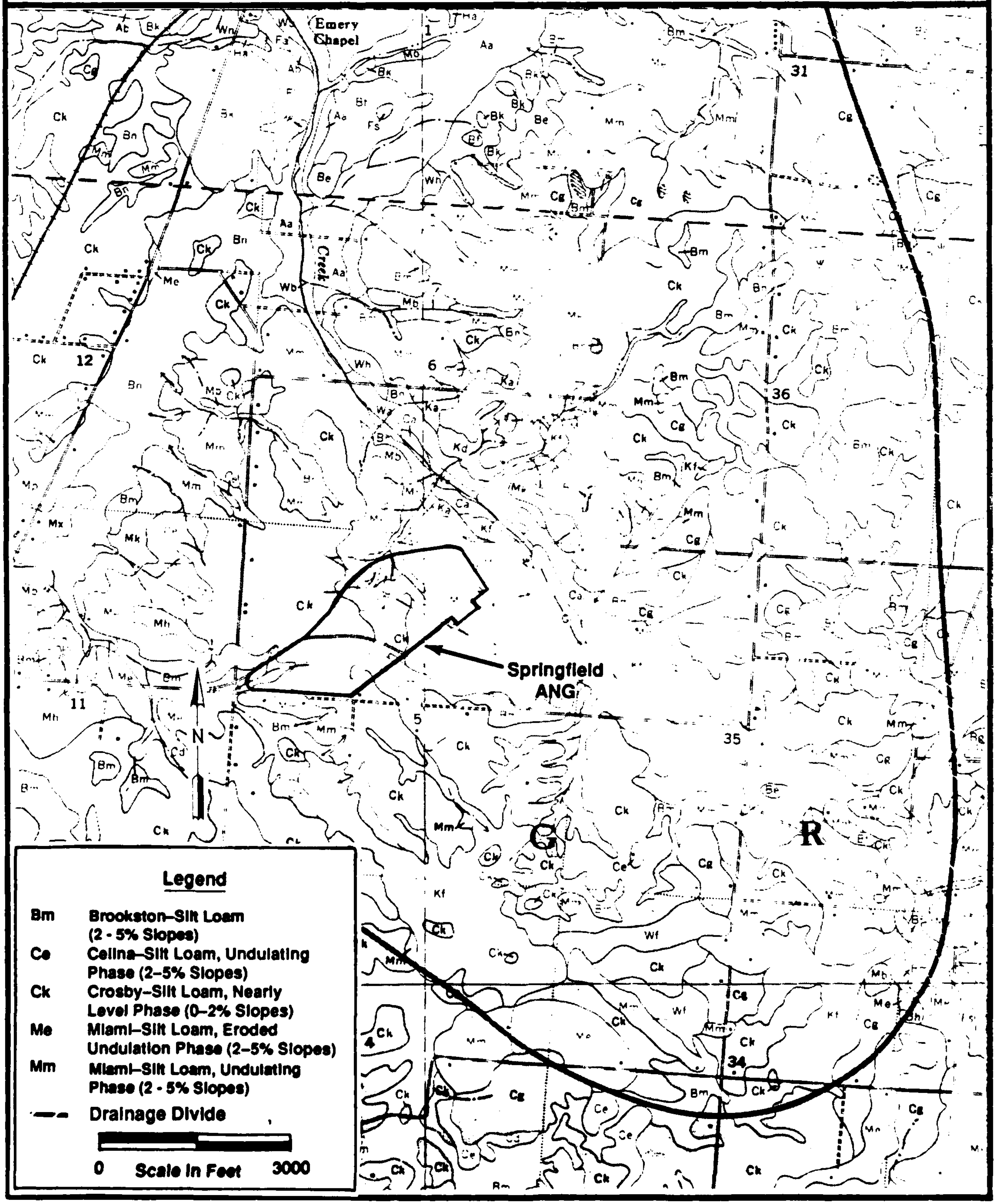
According to the USDA Soil Conservation Service, the soils at the Base consist of the Brookston silt loam (Bm); Celina silt loam, undulating (Ce); Crosby silt loam, nearly level phased (Ck); Miami silt loam, eroded (Me); and Miami silt loam, undulating phase (Mm) (see Figure 4A).

The Brookston silt loam (0 to 2 percent slopes) is dark colored and very poorly drained. It is similar to the Brookston silty clay loam except for its silt loam surface soil and slightly coarser texture throughout the profile. A typical profile consists of forest litter and dense grass mat over a very dark gray to black silty clay loam at the top 6 inches. From 6 to 15 inches the soil is a black silty clay loam, with a coarse granular structure and high organic matter content. From 15 to 24 inches the soil is a mottled olive, dark grayish-brown and very dark gray clay loam. At 24 to 52 inches the soil is a mottled olive-yellow and light gray gritty clay loam and contains sparse pebbles

Figure 4A.

Soil Survey Map of the Springfield ANG, Springfield-Beckley Airport and Vicinity.

HMTC Source: USDA, Soil Survey of Clark County, 1936–38.



of dolomite and limestone. Beyond 52 inches the soil is a mottled yellowish-brown and gray gravelly clay loam calcareous glacial till. It consists of unsorted silt, clay, sand and pebbles. Permeability is slow and the erosion hazard is slight.

The Celina silt loam, undulating phase (2 to 5 percent slopes) is known locally as a yellow or brown clay. It is moderately well drained and is found over calcareous glacial till. A profile consists of a yellowish-brown to grayish-brown, very friable silt loam in the top 8 inches. The next 8 to 12 inches consist of a yellowish-brown, friable silty clay loam. From 12 to 20 inches the soil consists of a yellowish-brown, weakly mottled with light grayish-brown, heavy silty clay loam. From 20 to 28 inches the soil is a dark yellowish-brown, slightly mottled with gray heavy clay loam. It contains some weathered glacial pebbles. Beyond 28 inches the soil is yellowish-brown, calcareous, compact glacial till of clay loam texture. The permeability is moderate (4.45×10^{-4} to 1.41×10^{-3} cm/sec) and the erosion hazard is moderate.

The surface layer of the Crosby silt loam is grayish brown, faintly mottled with light brownish-gray, very friable silt loam about 7 inches thick. It is medium acid and granular in structure. The subsurface layer is olive brown, strongly mottled with light brown-gray, strongly acid silty clay loam about 4 inches thick. It contains a few small, dark iron concretions and sand grains. The loam breaks into small nutlike pieces, and is firm when moist and hard when dry. The upper 6 inches of the subsoil is olive brown, mottled with dark grayish-brown and light brownish-gray, strongly acid silty clay loam. This portion of soil breaks into medium sized irregular blocky pieces. It is plastic when wet, very firm when moist, and very hard when dry. The next 16 inches is slightly acid, mottled yellowish-brown, dark grayish-brown and light brownish-gray clay loam. It breaks into coarse blocky pieces and becomes darker in color in the lower 8 to 10 inches and contains numerous small dark iron concretions. It is also very firm when moist and plastic when wet. The substratum, from the depth of about 33 inches, is light yellowish-brown, mottled with light brownish-gray, compact firm calcareous glacial till. It has a light

clay loam texture and massive structure. The permeability is slow (4.2 x 10-5 to 1.4 x 10^{-4} cm/sec) and the erosion hazard is slight.

The Miami silt loam, undulating phase (2 to 5 percent slopes) is a well drained, light colored upland soil. It is developed from calcareous glacial till. A typical profile consists of a light yellowish-brown or yellowish- brown silt loam in the top 7 inches. From 7 to 12 inches the soil is a yellowish-brown silty clay loam. From 12 to 23 inches the soil is a brown to yellowish-brown heavy clay loam and has a strongly developed medium subangular blocky structure. It also contains a few scattered limestone pebbles. From 22 to 28 inches the soil is a dark yellowish brown clay loam with moderately developed coarse subangular blocky structure. It contains some small limestone pebbles. Beyond 28 inches the soil is a light yellowish-brown loam (calcareous glacial till). The permeability is moderate (4.45 x 10^{-4} to 1.41 x 10^{-3} cm/sec) and the erosion hazard is moderate.

The Miami silt loam, eroded undulating phase (2 to 5 percent slopes) is a moderately, light colored, deep, well drained soil that has a yellowish brown or brown heavy silt loam surface. It is derived from calcareous glacial till. Except for the effects of erosion, it is like the Miami silt loam, undulating phase. Permeability is moderate (4.45 x 10^{-4} to 1.41 x 10^{-3} cm/sec) and the erosion hazard is high.

Soil boring data indicate a clay layer from the surface to 5 feet through 39 feet underlain by limestone ranging downwards to 140 feet. Occasionally, a sand layer appears at 20 feet or 30 feet. If the clay is separated by the sand layer the clay above the sand is yellow and blue below the sand layer. Gravel can also be found occasionally at approximately 20 feet.

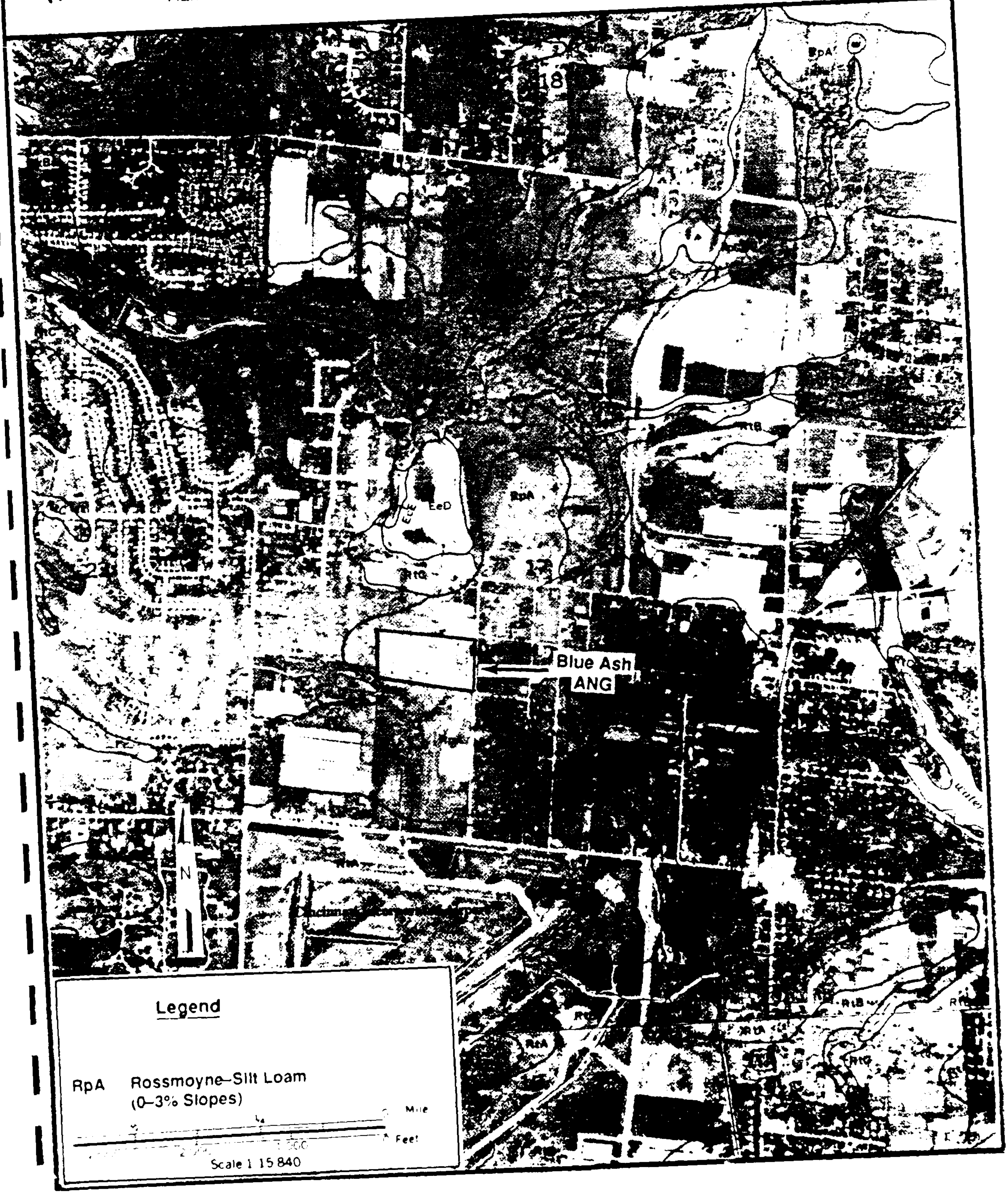
BLUE ASH:

According to the USDA Soil Conservation Service, the soil at the Station is comprised of predominantly the Rossmoyne silt loam with 0 to 3 percent slopes (see Figure 4B). Typically, the surface layer of this series is dark

Figure 4B.

Source: USDA, Soil Survey of Hamilton County, 1982.

Soil Survey Map of the Blue Ash ANG, Blue Ash Station and Vicinity.



grayish-brown, friable silt loam about 8 inches thick. The subsurface layer isof the same category except that this layer is brown and 4 inches thick. Permeability of the surface and subsurface layers is moderate (4.2×10^{-4} to 1.4×10^{-3} cm/sec) and the erosion hazard is slight.

The subsoil is yellowish-brown and about 64 inches thick. The upper part of the subsoil is mottled, friable and firm silty clay loam; the middle part is a fragipan consisting of mottled, very firm clay loam; and the lower part is mottled, firm clay loam. The substratum to a depth of about 90 inches is yellowish-brown, mottled, firm clay loam glacial till. Permeability of this section is moderately slow (4.2×10^{-5} cm/sec to 1.4×10^{-4}).

D. Hydrology

Surface Water

SPRINGFIELD:

The surface waters near the Base consist of the Mill Creek and two unnamed tributaries. The Mill Creek borders the northeast side of the airport. One of the tributaries flows directly west of the Base. It starts at the intersection of Blee and Peacock Roads. The second tributary starts south of the runway at the Clark and Green County boundaries (see Figure 2B, p. II-3). The airport rest on two drainage basins: the Mill Creek Drainage Basin and the Great Miami River Basin. The Mill Creek is part of the Mill Creek Drainage Basin. The unnamed tributaries are part of the Great Miami River Drainage Basin. The divide is located approximately 1 mile east of the Base forming a east-west divide then turning west to form a north-south divide at the southern end of the runway (see Figure 4A, p. III-8).

The Base drainage flows north into the Mill Creek. Figure 6A (p. IV-11) shows the Base drainge pattern.

The Mill Creek flows west for 3.6 miles into the Mad River. The unnamed northern tributary flows for 1 to 1 1/2 miles into the Mud Run which flows 10 miles into the Mad River. The unnamed southern tributary flows 1 to 1 1.2 miles into Yellow Springs Creek which flows 1 mile into the Little Miami River.

The Base lies outside the 100-year floodplain of all of the surrounding creeks (FIRM, July 1987).

BLUE ASH:

The Station is supplied by the Cincinnati Water Works which obtains its water from the Ohio River (12 miles to the south). The intake location is just upstream of the Little Miami River at California, Ohio, located at the Ohio River and I-275. Within 1989, the water will also be supplied by a well field in Butler County, 15-20 miles west of Blue Ash.

The surface water bodies in the vicinity of the Station include a small lake adjacent to the property on the southwest corner, several creeks and lakes (see Figure 2C, p. II-4). The Station is also within the drainage basin for an unnamed perennial creek located to the north, which eventually (2 miles) drains into the Mill Creek. Figure 6B (p. IV-16) shows the drainage pattern of the Station. Half a mile to the south, are the tributaries of North Branch Sycamore Creek. To the northeast are two lakes adjacent to the railroad tracks, 7/8 mile from the Station. The large creek is used for fishing along with the lakes. Sharon Woods and Lake are located to the north and are used for recreational purposes. The Station is outside of the 100-year floodplain of the surround creeks (FIRM, July 1987).

Groundwater

SPRINGFIELD:

Water for the Base was supplied by wells on Base property until early 1988. The Base is currently supplied by the City of Springfield which obtains its water

from 10 100-foot wells on Eagle City Road, located in the north part of the city.

The yearly low water level for most wells within the Till Plains Section of the Central Lowlands physiographic province occurs during the winter months. High water levels for the year usually occur from March through June. The yearly water level fluctuations in the water table and confined aquifer wells is commonly 3 to 5 feet. These fluctuations are predominantly due to seasonal climatic conditions.

According to the USGS Water Supply Paper 259, the aquifers of Clark County include both the surface deposits of alluvium, till and morainal deposits, and the rock formations of the Niagara Limestone, Brassfield Limestone, and Richmond Formation (see Figure 5A).

The alluvium in Clark County is of stream origin. The upper deposits are from present streams, but the lower deposits may be from older streams that flowed before or between the Wisconsinan and Illinoian glacial advances in the region. Examples of buried valleys are west of Springfield, near Sugar Grove, in an old channel of the Mad River marking an old Little Miami River. The valley deposits include sand and gravel with large amounts of silt, broken by sheets of pebbly clay from the glacial advances. Adequate supplies of water can be obtained from the alluvium at the borders of the valleys where its quality is higher due to a lower silt content.

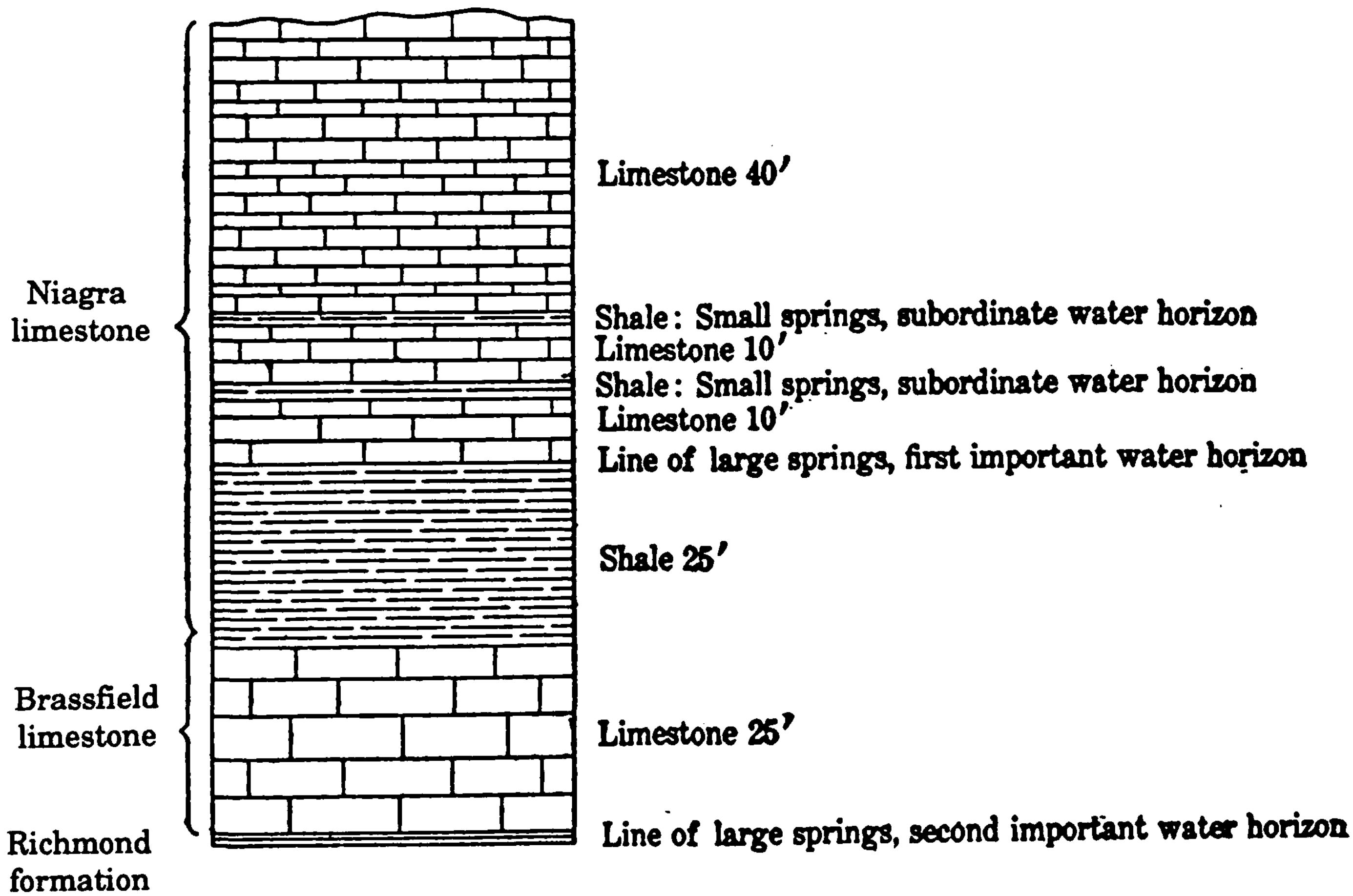
Till makes up the greater part of the surface deposits consisting of a sandy or pebbly clay containing sporadic boulders, but it generally includes either definite beds of sand and gravel or zones that are predominantly gravelly. The pebbly clay contains gravelly layers or even beds of sand or gravel which have an abundant supply of water. Wells at 25 to 40 feet in depth yield sufficient supplies for domestic use. Occasionally, the water is under pressure and causes flowing water wells.

Morainal deposits, consisting of sand and gravel, are the remains of glacial retreat. Generally, they tend to be too porous to retain water, thus containing

HMTC Source: U.S.G.S. Water Supply Paper 259, 1912.

Figure 5A.

Rock Formation Aquifiers of Clark County.



little or no available water (Fuller, 1912).

The Niagara Limestone is approximately 100 feet in thickness and varies in character in its different portions. Near the base, along the contact with the Brassfield Limestone, is 25 feet of shaly limestone or calcareous shale overlain by 8 feet of massive limestone, a thin layer of shale, 15 feet of limestone known as the Springfield Limestone and 40 feet of massive or irregular limestone. The lower shaly portion of the formation contains little or no water, however the limestone layers contain an abundance of water. The shales are important as they limit downward penetration of water, which collects in the lower part of the overlying limestone beds where it is available to wells or emerges as springs. This is the best rock horizon in the county for obtaining water through wells.

The Brassfield Limestone is an irregularly bedded, semi-crystalline, yellowish, pinkish or reddish limestone about 25 feet thick. The limestone is somewhat sandy and porous in its lower portion and in places has a considerable quantity of water, which is retained by the underlying shales and emerges as strong springs along outcrops. Much of the upper part of the Brassfield Limestone is dense and impervious to groundwater where it is also reclaimed and emerges as springs. The formation may be expected to yield satisfactory supplies to wells for a distance of several miles back from its outcrops and give small or moderate supplies over nearly the entire county.

The Richmond Formation, which consists of thin alternating beds of limestones and shales, underlies the alluvial deposits of Mad River Valley up to the vicinity of Snyderville, those of Mud Run south of Enon, and those of the West Fork of Honey Creek north of New Carlisle. The formation contains considerable water, but since it is overlain by the Niagara and Brassfield Limestones or the alluvial deposits, which are a better water source, there is little occasion to use this formation as a source. Its upper portion is shaly and serves as an aquiclude of the Brassfield Limestone.

Well log and drilling reports supplied by the Ohio Department of Natural Resources, Division of Water, indicate the water level at a depth of 14 feet and a pumping capacity of 100 gallons per minute (GPM) in 1954. A well located across B₍ee Road has a water level of 15 feet below ground surface, and a pumping rate of 1200 GPM. A well owned by Beacon Airways in 1968, located southwest of the Guard, has a water level of 12 feet below ground surface, a pumping rate of 10 GPM, and clear water quality. Two other wells on airport property have water levels of 14 feet below ground surface and 28 feet, and pumping rates of 70 GPM and 900 GPM, respectively. Another well on airport property yields 60 GPM from the limestone aquifer (see Figure 5B).

BLUE ASH:

The groundwater in the area is found within two aquifers, the Upper Miami Valley Aquifer and the Lower Bedrock Aquifer. The Miami Aquifer is composed of very permeable alluvium, terrace gravels, tills, and outwash, therefore, well yields tend to be high. Well data from Sycamore Township (adjacent to the west) have water levels from 8 to 179 feet below ground surface and yield 200 GPM. (Klaer & Thompson, 1948).

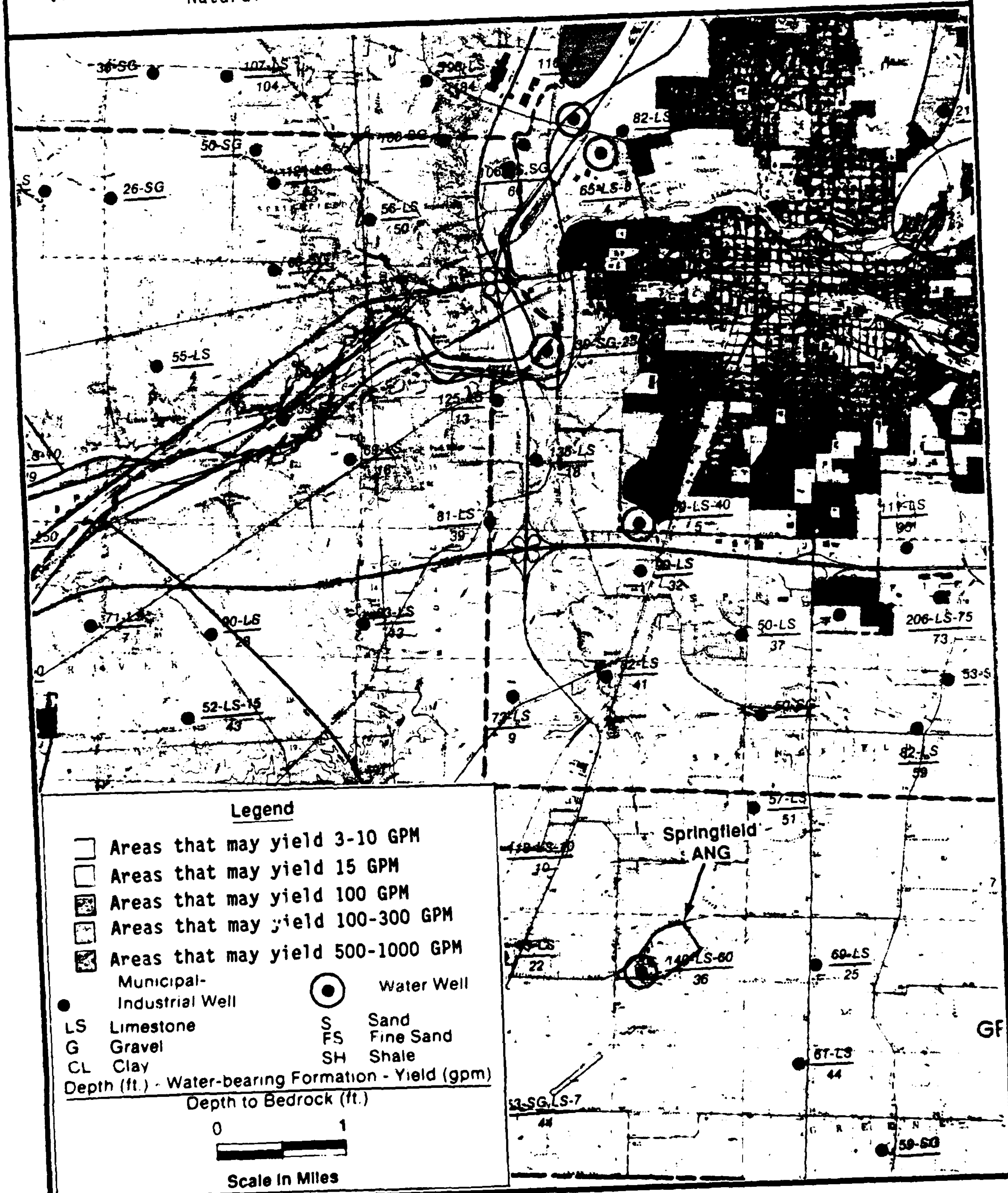
Specifically, the Station lies over a poor source of groundwater. Bedrock consists of interbedded plastic shales and thin limestone layers. If water is present in the rock, it usually occurs in the upper few feet where the strata have been some what weathered and broken. Overlying glacial cover is generally less than 50 feet thick and consists largely of clay. Occasional lenses of sand and gravel will supply small yields. Wells screened in this unit seldom produce more than 3 GPM (see Figure 5C).

Information supplied by the Ohio Department of Natural Resources, Division of Water, shows water wells 1/2 and 3-1/2 miles to the east, 1 mile to the west and 1-3/4 miles to the southwest. The well to the west has no available data. The well to the near east was drilled to a depth of 132 feet and yielded no water. The far east well was drilled to a depth of 70 feet and was also dry.

Figure 5B.

HMTC Source: Ohio Department of Natural Resources, 1982

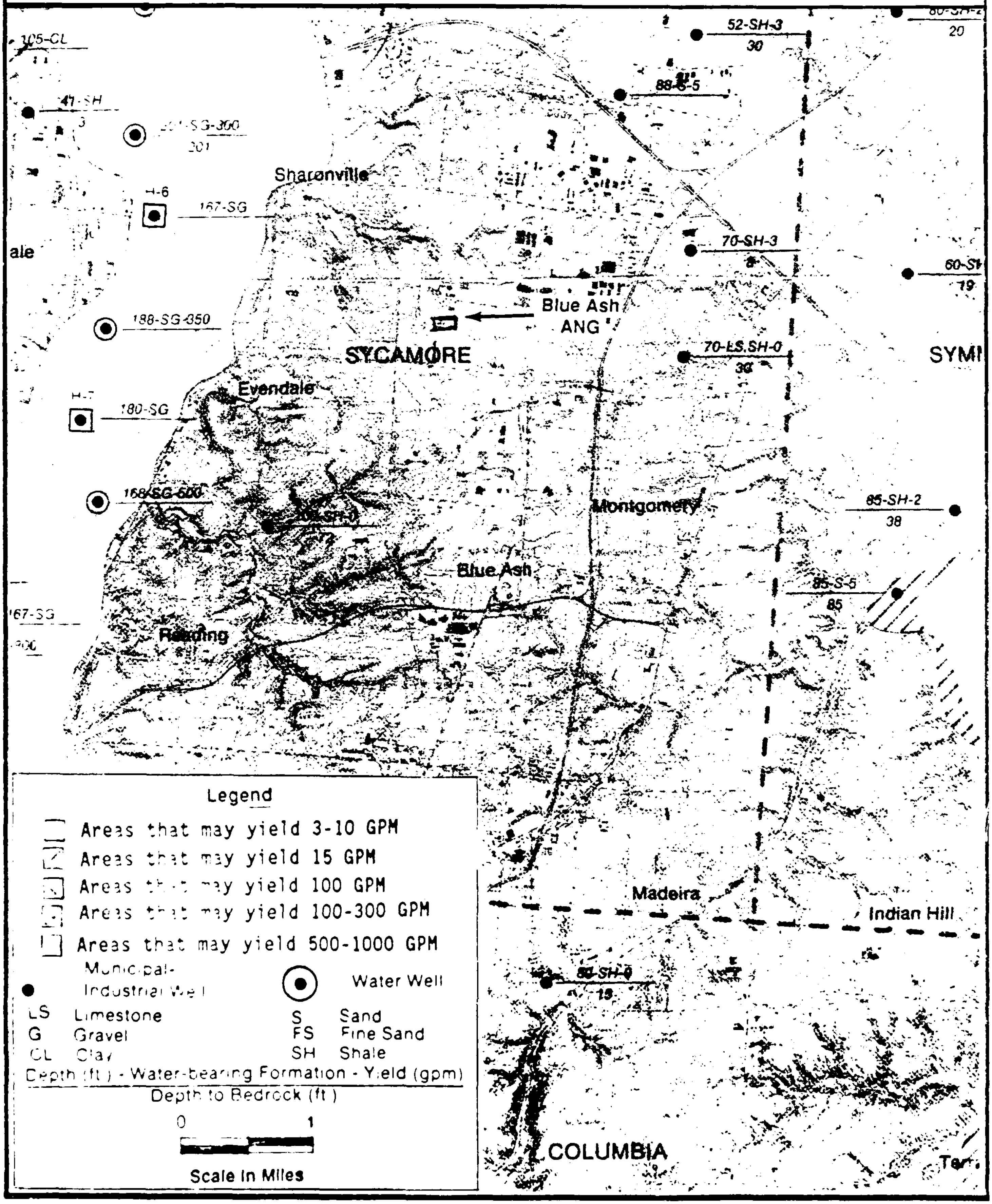
Ground Water Resources of Clark Co.



HMTC Source: Ohio Department of Natural Resources, 1986.

Figure 5C.

Ground Water Resources of Hamilton Co.



The wells to the southwest along Cooper Road yielded water at 58 feet and 21 feet. One well was dry to a depth of 100 feet.

E. Critical Environments

SPRINGFIELD:

According to the Ohio Division of the U.S. Fish and Wildlife Service, the Indiana Bat is an endangered species of Clark County. There are no critical habitats, or wilderness areas within a 1-mile radius of the Base; however, there are wetlands about 1-1/2 miles to the southwest.

BLUE ASH:

According to the Ohio Division of the U.S. Fish and Wildlife Service, the Indiana Bat, American Bald Eagle, and Running Buffalo Clover are endangered species of Hamilton County. The bald eagle uses the area as a winter habitat. There are no critical habitats or wilderness areas within Hamilton County. There are no wetlands within a 1-mile radius of the Station.

IV. SITE EVALUATION

A. Activity Review

BASE:

A review of Base records and interviews with Base personnel resulted in the identification of specific operations at the Base in which the majority of industrial chemicals are handled and hazardous wastes are generated. A total of 19 past and present Base personnel with an average of 18 years experience at the Base were interviewed. These personnel were representative of Civil Engineering; Bio-environmental Engineering; Vehicle Maintenance; Aerospace Ground Equipment (AGE) Maintenance; Petroleum, Oils, and Lubricants (POL) Management; Photographic Processing; Nondestructive Inspection (NDI); Power Production; Hydraulic Shop; Base Operations; Fire Station; Supply; Munitions; and Battery Shops. Table 1A summarizes these major operations, provides estimates of the quantities of waste currently being generated by these operations, and describes the past and present disposal practices for the wastes. Based on information gathered, any operation that is not listed in Table 1A has been determined to produce negligible quantities of wastes requiring disposal.

STATION:

A review of Station records and interviews with Station personnel resulted in the identification of specific operations at the Station in which the majority of industrial chemicals are handled and hazardous wastes are generated. A total of three present Station personnel with an average of 21 years experience at the Station were interviewed. These personnel were representative of AGE Maintenance, Vehicle Maintenance and Field Maintenance. Table 1B summarizes these major operations, provides estimates of the quantities of waste currently being generated by these operations, and describes the past and present disposal practices for the wastes. Based on information gathered, any operation that is

Table IA. Hazardous Material/Hazardous Waste Disposal Summary: Ohio Air National Guard, Springfield-Beckley Municipal Airport, Springfield, Ohio

Shop Name and Location	Hazardous Waste/ Used Hazardous Material	Estimated Quantities (Gallons/Year)	Method of Treatment/Storage/Disposal 1950 — 1960 — 1970 — 1980 — 1988
178th TFG			
Aircraft Maintenance Bldg. 101	PD-680 solvent	120	|--FTA--|--DRMO--|
	Trichloroethane	50	|--CONT--|-DRMO-|
	Battery Acid	10	|--GRND TRAPS--|
	Carbon Cleaner	50	|--CONT--|--DRMO--|
	Stripper (MEK)	20	|--CONT--|--DRMO--|
	Synthetic Turbine Oil	80	|--CONT--|--DRMO--|
	JP-4	400	|--CONT--|--DRMO--|
	PS-661 Solvent	500	|--CONT--|--DRMO--|
	Zyglo Emulsifier	20	|--CONT--|--DRMO--|
	7808 Oil	40	|--CONT--|--DRMO--|
	Hydraulic Oil	40	|--CONT--|--DRMO--|
	Engine Oil	40	|--CONT--|--DRMO--|

KEY:
FTA - Disposed of at the Fire Training Area.
DRMO - Disposed of through the Defense Reutilization and Marketing Office.
CONT - Disposed of through a private contractor.
GRND - Disposed of on the ground.
GRND TRAPS - Disposed of through ground traps w/neutralization.
LNDFL - Disposed of in a landfill.
SAN - Disposed of in the sanitary sewer.
ACID NEUT - Disposed of by acid neutralization.
TRASH - Disposed of in general refuse.

Table 1A. Hazardous Material/Hazardous Waste Disposal Summary: Ohio Air National Guard, Springfield-Beckley Municipal Airport, Springfield, Ohio (Continued)

Shop Name and Location	Hazardous Waste/ Used Hazardous Material	Estimated Quantities (Gallons/Year)	Method of Treatment/Storage/Disposal 1950–1970	1970–1988
178th TFG (continued)				
AGE Bldg. 119	Engine Oil	250	CONT	DRMO
	Hydraulic Oil	10	CONT	DRMO
	Paint Stripper/Thinner	20	CONT	DRMO
	JP-4	40	CONT	DRMO
	PD-680	20	CONT	DRMO
	Parts Cleaner	10	CONT	DRMO
	Turbine Oil	10	CONT	DRMO
	Motor Oil	10	CONT	DRMO
	Battery Acid	5	CONT	DRMO
	7808 Oil	20	CONT	DRMO
NDI Bldg. 101	Penetrant	50	CONT	DRMO
	Emulsifier	50	CONT	DRMO
	Developer	50	CONT	DRMO

KEY:
FTA - Disposed of at the Fire Training Area.
DRMO - Disposed of through the Defense Reutilization and Marketing Office.
CONT - Disposed of through a private contractor.
GRND - Disposed of on the ground.
GRND TRAPS - Disposed of through ground traps w/neutralization.
LNDFL - Disposed of in a landfill.
SAN - Disposed of in the sanitary sewer.
ACID NEUT - Disposed of by acid neutralization.
TRASH - Disposed of in general refuse.

Table IA. Hazardous Material/Hazardous Waste Disposal Summary: Ohio Air National Guard, Springfield-Beckley Municipal Airport, Springfield, Ohio (Continued)

Shop Name and Location	Hazardous Waste/ Used Hazardous Material	Estimated Quantities (Gallons/Year)	Method of Treatment/Storage/Disposal 1950–1970	1970–1988
178th TFG (continued)				
Corrosion Control Bldg. 129	PD-680	10	CONT	DRMO
	Thinner	40	CONT	DRMO
	Stripper	40	CONT	DRMO
	Lacquer	20	CONT	DRMO
Machine Shop Bldg. 101	Metal Cutting Oils	5	CONT	DRMO
	Lubricating Oils	5	CONT	DRMO
Electric Shop Bldg. 101	Battery Acid	2	CONT	DRMO
Battery Shop Bldg. 120	Used batteries	12 batteries	CONT	DRMO

KEY:
- FTA - Disposed of at the Fire Training Area.
- DRMO - Disposed of through the Defense Reutilization and Marketing Office.
- CONT - Disposed of through a private contractor.
- GRND - Disposed of on the ground.
- GRND TRAPS - Disposed of through ground traps w/neutralization.
- LNDFL - Disposed of in a landfill.
- SAN - Disposed of in the sanitary sewer.
- ACID NEUT - Disposed of by acid neutralization.
- TRASH - Disposed of in general refuse.

Table IA. Hazardous Material/Hazardous Waste Disposal Summary: Ohio Air National Guard, Springfield-Beckley Municipal Airport, Springfield, Ohio (Continued)

Shop Name and Location	Hazardous Waste/ Used Hazardous Material	Estimated Quantities (Gallons/Year)	Method of Treatment/Storage/Disposal 1950–1960	1960–1970	1970–1980	1980–1988
178th TFG (continued)						
Engine Shop Bldg. 120	PD-680	80		FTA	CONT	CONT
	TCA	4			CONT	
	Carbon Cleaners	45			CONT	CONT
	Strippers	2			CONT	CONT
	7808 Oil	12		FTA	CONT	CONT
	Hydraulic Oil	6		FTA	CONT	CONT
	Engine Oil	72		FTA	CONT	CONT
	Cleaning Solution	20			LNDFL	LNDFL
Avionics/Weapons Maintenance Bldg. 128	Thinners/Lacquers	4			DRMO	DRMO
Photographic Laboratory Bldg. 101	Developer	24				SAN
	Fixer	36				DRMO

KEY:
- FTA - Disposed of at the Fire Training Area.
- DRMO - Disposed of through the Defense Reutilization and Marketing Office.
- CONT - Disposed of through a private contractor.
- GRND - Disposed of on the ground.
- GRND TRAPS - Disposed of through ground traps w/neutralization.
- LNDFL - Disposed of in a landfill.
- SAN - Disposed of in the sanitary sewer.
- ACID NEUT - Disposed of by acid neutralization.
- TRASH - Disposed of in general refuse.

Table 1A. Hazardous Material/Hazardous Waste Disposal Summary: Ohio Air National Guard, Springfield-Beckley Municipal Airport, Springfield, Ohio (Continued)

Shop Name and Location	Hazardous Waste/ Used Hazardous Material	Estimated Quantities (Gallons/Year)	Method of Treatment/Storage/Disposal 1950	1960	1970	1980	1988
178th TFG (Continued)							
Vehicle Maintenance Bldg. 107	Sulfuric Acid	120			ACID NEUT		
	JP-4	5			DRMO		
	Ethylene Glycol	100			DRMO		
	Hydraulic Oil	75			DRMO		
	Transmission Fluid	25			DRMO		
	Motor Oil	500			DRMO		
	Paint Thinner	20			DRMO		
	Brake Fluid	3			DRMO		
	Diesel Fuel	2			DRMO		
Paint Shop Bldg. 119	Thinner	20			DRMO		
	Paint Containers	250 cans			TRASH		
	MEK	1			DRMO		
	Stripper Residue	1			DRMO		

KEY:
FTA - Disposed of at the Fire Training Area.
DRMO - Disposed of through the Defense Reutilization and Marketing Office.
CONT - Disposed of through a private contractor.
GRND - Disposed of on the ground.
GRND TRAPS - Disposed of through ground traps w/neutralization.
LNDFL - Disposed of in a landfill.
SAN - Disposed of in the sanitary sewer.
ACID NEUT - Disposed of by acid neutralization.
TRASH - Disposed of in general refuse.

Table IA. Hazardous Material/Hazardous Waste Disposal Summary: Ohio Air National Guard, Springfield-Beckley Municipal Airport, Springfield, Ohio (Continued)

Shop Name and Location	Hazardous Waste/ Used Hazardous Material	Estimated Quantities (Gallons/Year)	Method of Treatment/Storage/Disposal 1950 1960 1970 1980 1988
178th CCS (Continued)			
Battery Shop Bldg. 107	Used Batteries	75 batteries	1970–1988: DRMO
	Battery acid	120	1970–1988: ACID NEUT
POL Bldg. 113	JP-4	175	1950–1980: FTA; 1980–1988: CONT
	Tank Cleaning Sludge	66	1970–1988: CONT
Entomology Bldg. 131	Motor Oil	100	1970–1988: DRMO
	Engine Oil	100	1970–1988: DRMO
	Empty Pesticide Containers	10 cans	1970–1988: LNDFL
Energy Plant Bldg. 101	Waste Oil	1500	1970–1988: DRMO
	Boiler Feedwater Treatment	minute amt	1970–1988: SAN

KEY:
FTA - Disposed of at the Fire Training Area.
DRMO - Disposed of through the Defense Reutilization and Marketing Office.
CONT - Disposed of through a private contractor.
GRND - Disposed of on the ground.
GRND TRAPS - Disposed of through ground traps w/neutralization.
LNDFL - Disposed of in a landfill.
SAN - Disposed of in the sanitary sewer.
ACID NEUT - Disposed of by acid neutralization.
TRASH - Disposed of in general refuse.

Table 1A. Hazardous Material/Hazardous Waste Disposal Summary: Ohio Air National Guard, Springfield-Beckley Municipal Airport, Springfield, Ohio (Continued)

Shop Name and Location	Hazardous Waste/ Used Hazardous Material	Estimated Quantities (Gallons/Year)	Method of Treatment/Storage/Disposal 1950 — 1960 — 1970 — 1980 — 1988
269th CCS			
Ground/AGE Maintenance Bldg. 109	Paint Stripper	2	1960–1988: GRND
	Engine Oil	120	1960–c.1970: CONT; c.1970–1988: DRMO
	Sulfuric Acid	40	1960–1988: NEUT SAN
	Ethylene Glycol	80	1960–1988: GRND
	Lubricating Oil	10	1960–1988: DRMO
	Hydraulic Oil	5	1960–1988: DRMO
	Transmission Fluid	5	1960–1988: DRMO
	Motor Oil	5	1960–1988: DRMO
	Paint Thinner	7	1960–1988: LNDFL
	Brake Fluid	5	1960–1988: SAN
	Grease (Bearing)	2	1960–1988: GRND

KEY:
FTA - Disposed of at the Fire Training Area.
DRMO - Disposed of through the Defense Reutilization and Marketing Office.
CONT - Disposed of through a private contractor.
GRND - Disposed of on the ground.
GRND TRAPS - Disposed of through ground traps w/neutralization.
LNDFL - Disposed of in a landfill.
SAN - Disposed of in the sanitary sewer.
ACID NEUT - Disposed of by acid neutralization.
TRASH - Disposed of in general refuse.

Table IA. Hazardous Material/Hazardous Waste Disposal Summary: Ohio Air National Guard, Springfield-Beckley Municipal Airport, Springfield, Ohio (Continued)

Shop Name and Location	Hazardous Waste/ Used Hazardous Material	Estimated Quantities (Gallons/Year)	Method of Treatment/Storage/Disposal 1950 – 1960 – 1970 – 1980 – 1988
269th CCS (Continued)			
AGE	Engine Oil	80	1960–1970 CONT; 1970–1988 DRMO
	Paint Strippers/Thinners	3	1960–1988 LNDFL
	Battery Acid	40	1960–1988 NEUT SAN
	Lubrication Oil	2	1960–1970 LNDFL
	Diesel Fuel	50	1980–1988 DRMO
	Engine Oil	40	1960–1970 GRND; 1970–1988 CONT
	Paint Strippers/Thinners	15	1960–1970 GRND; 1970–1988 DRMO
	JP-4	50	1960–1970 GRND; 1970–1988 DRMO
	PD-680	40	1960–1970 GRND; 1970–1988 DRMO
	Turbine Oil	40	
	Battery Acid	2	1960–1970 GRND; 1970–1988 DRMO
	Ethylene Glycol	16	1960–1988 SAN
	Carbon Removing Compound	5	1960–1988 DRMO
	Paint	20	1960–1988 DRMO

KEY:
FTA - Disposed of at the Fire Training Area.
DRMO - Disposed of through the Defense Reutilization and Marketing Office.
CONT - Disposed of through a private contractor.
GRND - Disposed of on the ground.
GRND TRAPS - Disposed of through ground traps w/neutralization.
LNDFL - Disposed of in a landfill.
SAN - Disposed of in the sanitary sewer.
ACID NEUT - Disposed of by acid neutralization.
TRASH - Disposed of in general refuse.

Table IB. Hazardous Material/Hazardous Waste Disposal Summary: Ohio Air National Guard, Blue Ash ANG Station, Cincinnati, Ohio

Shop Name and Location	Hazardous Waste/ Used Hazardous Material	Estimated Quantities (Gallons/Year)	Method of Treatment/Storage/Disposal 1950 — 1960 — 1970 — 1980 — 1988
Vehicle Maintenance Bldg. 4	Engine Oil	1400	1960 |---GRND---| 1970 |---CONT---| 1988
	Sulfuric Acid	60	1960 |---GRND---| 1970
	Ethylene Glycol	880	1960 |---SAN---| 1988
	Hydraulic Oil	5	1960 |---GRND---| 1970 |---DRMO---| 1988
	Transmission Fluid	10	1960 |---GRND---| 1970 |---DRMO---| 1988
	Paint Thinner	50	1960 |---GRND---| 1970 |---DRMO---| 1988
	Brake Fluid	13	1960 |---GRND---| 1970 |---DRMO---| 1988
	Grease (Bearing)	1	1960 |---SAN---| |---TRASH---| 1988
	Paint	95	1960 |---DRMO---| 1988
	Carbon Removing Compound	110	1960 |---DRMO---| 1988
	Cutting Fluid	1	1960 |---GRND---| 1970 |---DRMO---| 1988

KEY:
- FTA - Disposed of at the Fire Training Area.
- DRMO - Disposed of through the Defense Reutilization and Marketing Office.
- CONT - Disposed of through a private contractor.
- GRND - Disposed of on the ground.
- GRND TRAPS - Disposed of through ground traps w/neutralization.
- LNDFL - Disposed of in a landfill.
- SAN - Disposed of in the sanitary sewer.
- ACID NEUT - Disposed of by acid neutralization.
- TRASH - Disposed of in general refuse.

not listed in Table 1B has been determined to produce negligible quantities of wastes requiring disposal.

B. Disposal/Spill Site Identification, Evaluation, and Hazard Assessment

BASE:

Interviews with Base personnel and subsequent site inspections resulted in the identification of six sites potentially contaminated with HM/HW at the Base. Figure 6A illustrates the locations of the identified sites.

The six identified sites at the Base were assigned a HAS according to HARM (Appendix C). A summary of the HAS for each scored site is listed in Table 2A. Copies of the Guidelines, Site Factor Rating Criteria and completed Hazardous Assessment Rating Forms are found in Appendix D. The objective of this assessment is to provide a relative ranking of sites suspected of contamination from hazardous substances.

The final rating score reflects specific components of the hazard posed by a specific site: possible receptors of the contamination (e.g., population within a specified distance of the site and/or critical environments within a 1-mile radius of the site); the waste and its characteristics; and the poten- tial pathways for contaminant migration (e.g., surface water, groundwater, flooding). Descriptions of all the sites follow.

Site No. 1 - Fire Training Area 1 (HAS-79)

A Fire Training Area (FTA), used from 1957 to 1963, was located behind the Avionics Building. Anything ignitable was burned in large quantities. No cleanup was implemented at this FTA. This FTA was not observed during the site visit, since its existence was unknown at that time.

Source: Springfield Air National Guard Base Map.

Figure 6A.

Site Map, Ohio Air National Guard, Springfield–Beckley Municipal Airport, Springfield, Ohio.

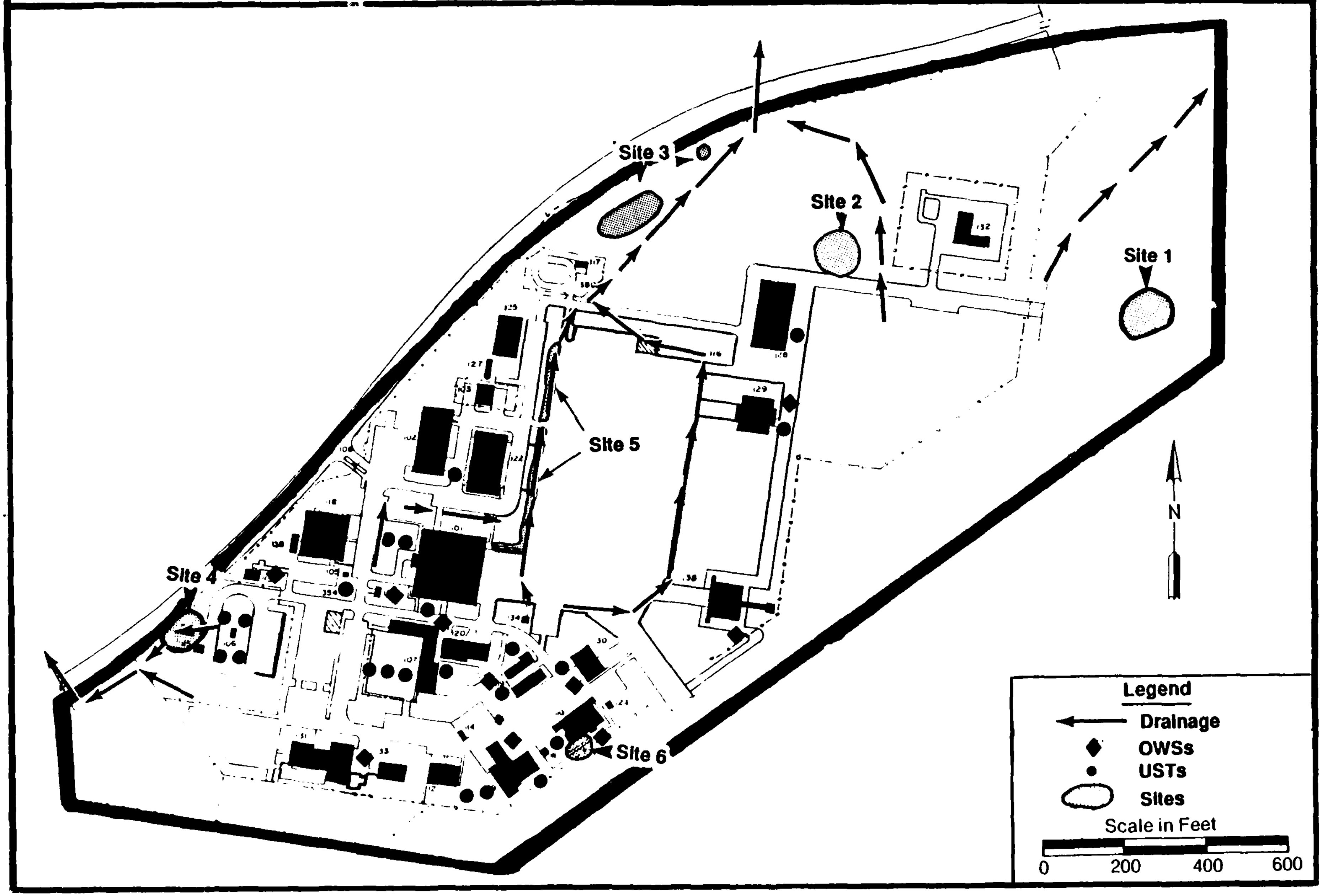


Table 2A. Site Hazard Assessment Scores (as derived from HARM): Springfield Air National Guard, Springfield-Beckley Municipal Airport, Springfield, Ohio

Site Priority	Site No.	Site Description	Receptors	Waste Characteristics	Pathway	Waste Mgmt. Practices	Overall Score
1	1	FTA 1	58	100	80	1.0	79
2	2	FTA 2	58	100	80	1.0	79
3	3	Leach Field and Outfall	58	50	80	1.0	63
4	4	POL Spill	58	40	80	1.0	59
5	6	Mess Hall UST Spill	58	45	80	1.0	59
6	5	Ramp Drainage Ditch	58	32	80	1.0	57

Standard procedure was to float the fuel on water, ignite, extinguish and relight. The FTA was used four times per year, using approximately 500 gallons of fuel per burn.

To score the site, a large quantity release was used assuming a 70 percent burn for 500 gallons for six years, four times a year; a flashpoint of less than 80°F for JP-4, and a Sax's Level 3 toxicity for JP-4.

<u>Site No. 2 - Fire Training Area 2</u> (HAS-79)

A second FTA was in operation from 1967 until 1980. The Base has been the sole operator of the FTA. The Fire Department burned JP-4 and any ignitables at the area. The Fire Department was supplied off-specification fuel from the airport, industry in Springfield and Wright-Patterson AFB (JP-4 only).

Standard procedure was to float the fuel on water, ignite, extinguish and relight. The FTA was used four times per year, using 1,000 to 1,500 gallons of fuel per burn. During the site visit, stained soil and stressed vegetation were observed. The pit is constructed of sand-stone-sand compacted layers about 2 feet deep, however, the soil berm has been graded down. Fuel was supplied to the pit by a pipeline that runs from the pad edge to the center of the pit.

To score the site, a 70 percent burn was assumed of 1,000 gallons for 13 years, four times a year. This calculates to 15,600 gallons of residual fuel. Since JP-4 fuel was burned, the ignitability factor is a flash-point of less than 80°F, and a toxicity of Sax's Level 3.

<u>Site No. 3 - Leach Field and Outfall</u> (HAS-63)

From the 1950's to 1980, the Base sewer system consisted of oil water separators (OWSs) at AGE, NDI, Motor Pool, Munitions, Civil Engineering, POL, and Fire Station. The OWS effluent flowed through the sanitary sewer system, which drained into a septic tank and leach field. The Hush House has an OWS

that drains into the storm sewer system and subsequently into a sand filter. The hangar and POL Management have acid neutralizers which drain into the sanitary sewer system. Waste oils, solvents, battery acid, photographic chemicals, ethylene glycol, cleaner, degreaser, and fuel were disposed of through the sewer system. The Base converted to the municipal water and sewer systems in early 1988.

The site was scored assuming a small quantity release, a flashpoint of less than 80°F (since oils and solvents have the lowest ignitability) and a Sax's Level 3 toxicity due to the high hazard of the chemicals disposed of in the system.

Site No. 4 - POL Spill (HAS-59)

In 1972, 1,000 gallons of JP-4 was released due to a refueling valve failure. The fuel drained to a ditch off Base property, flowed along the road, and migrated 3,000 feet to an adjacent farm's fish pond (see Figure 2B, p. II-3), where it killed ducks and fish. No cleanup effort was conducted.

The site was scored as a small quantity release, with a flashpoint of less than 80°F and a Sax's Level 3 toxicity.

Site No. 5 - Ramp Drainage Ditch (HAS-57)

The ramp drainage ditch handles all the storm water run off from the aircraft parking ramp. The water consolidates with other storm waters and flows into an outfall to the north of the property. During the site visit an oil sheen was observed in standing water within the ditch, however, no stressed vegetation was seen.

The site was scored assuming a small quantity release, a flashpoint of 140° to 200°F (since the volatiles have probably evaporated), and a toxicity of Sax's Level 2 which are substances that may produce irreversable or

reversible changes in the body, but do not threaten life or produce serious physical impairment.

Site No. 6 - Mess Hall Underground Storage Tank Oil Spill (HAS-59)

In 1984, the Mess Hall UST for heating oil was replaced; about 40 gallons were left in the tank. The oil was spilled between the building and the fence line during the removal of this tank. The tank was removed due to the intaking of water; no outward leaking was found upon removal. No clean up efforts were made.

The site was scored as a small quantity release with a flashpoint of less than 80°F and Sax's Level of 3.

STATION:

Interviews with Station personnel and subsequent site inspections resulted in the identification of two sites potentially contaminated with HM/HW. Figure 6B illustrates the locations of the identified sites.

The two identified sites at the Station were assigned a HAS according to HARM (Appendix C). A summary of the HAS for each scored site is listed in Table 2B. Copies of the completed Hazardous Assessment Rating Forms are found in Appendix D. The objective of this assessment is to provide a relative ranking of sites suspected of contamination from hazardous substances.

The final rating score reflects specific components of the hazard posed by a specific site: possible receptors of the contamination (e.g., population within a specified distance of the site and/or critical environments within a 1-mile radious of the site); the waste and its characteristics; and the potential pathways for contaminant migration (e.g., surface water, groundwater, flooding). Description of all the site follow.

HMTC

Source: Blue Ash Air National Guard Base Map.

Figure 6B.
Site Map, Ohio Air National Guard, Blue Ash Ang Station, Cincinnati, Ohio.

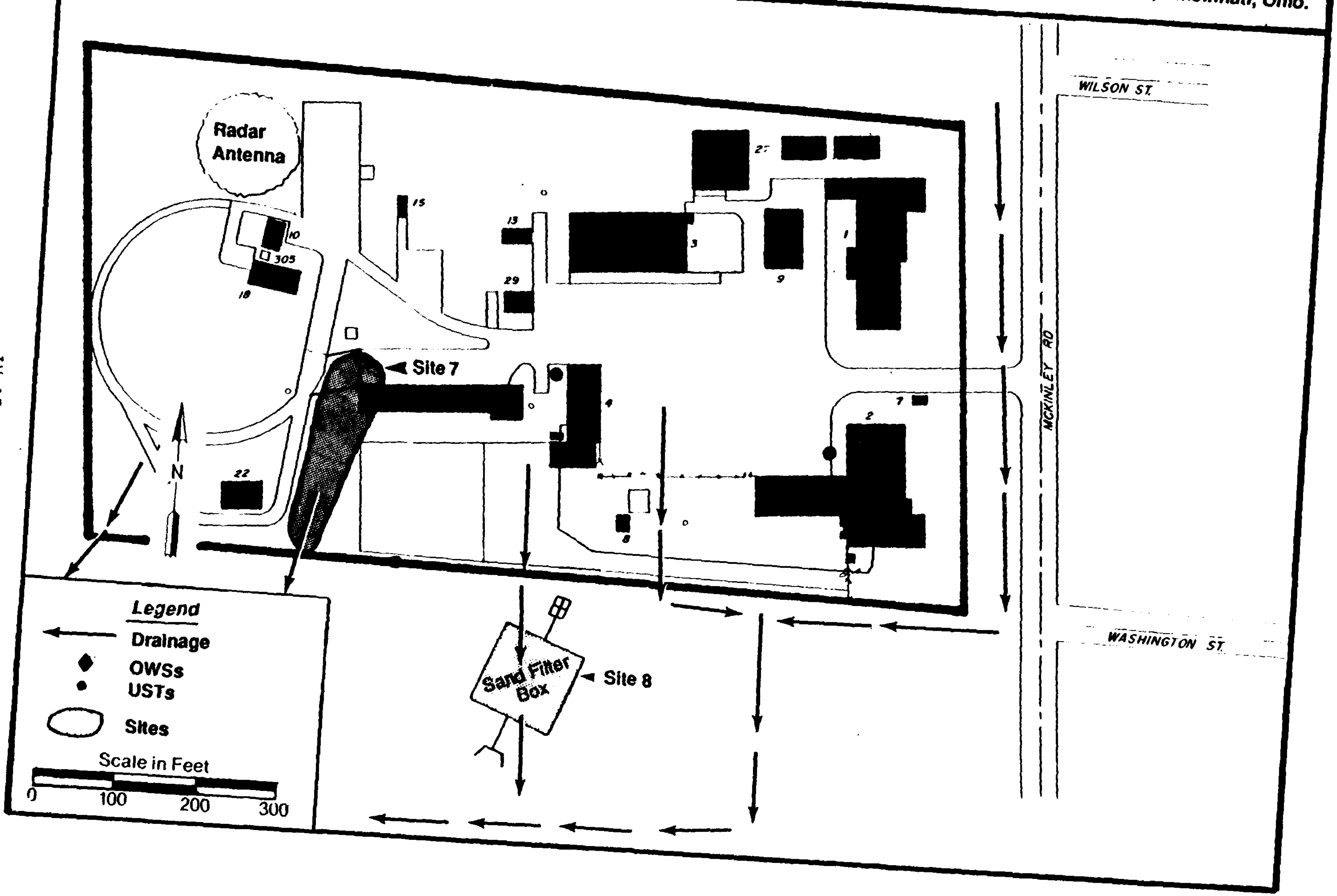


Table 2B. Site Hazard Assessment Scores (as derived from HARM): Blue Ash Air National Guard, Blue Ash ANG Station, Cincinati, Ohio

Site Priority	Site No.	Site Description	Receptors	Waste Characteristics	Pathway	Waste Mgmt. Practices	Overall Score
1	7	Diesel Fuel Spil	46	40	80	1.0	55
2	8	Leach Feild	46	32	80	1.0	53

Site No. 7 - Diesel Fuel Spill (HAS-55)

A 200-gallon diesel fuel spill occurred about winter 1983 near the AGE shop. The fuel drained off Station property into a field. No cleanup efforts were made. The land where the spill occurred was regraded for a road leading to a parking lot in 1985.

The site was scored as a small quantity release with a flashpoint of less than 80°F and a Sax's Level 3 toxicity.

Site No. 8 - Leach Field (HAS-53)

The Station's sanitary sewer system consists of OWSs which drain to a leach field located off Station property. The system takes waste from the AGE shop, Motor Pool, along with other facilities on the Station.

The site was scored assuming a small quantity release, a flashpoint from 140°F to 200°F since most volatiles would have evaporated over time or the wastes are not highly flammable and a toxicity of Sax's Level 2 since the wastes effect could be either permanent or irreversable on a molecular level in the body.

C. Other Pertinent Information

BASE:

The Base has 10 OWSs and 22 underground storage tanks (USTs). The OWSs are connected to the city sewer system. Prior to 1988, the OWSs were connected to the sand filter and leach field. A UST inventory is included as Appendix E, and the locations are shown on Figure 6A, p. IV-11.

The Civil Engineering Storage Area was located outside, behind the Civil Engineering Building. Pesticides, herbicides, oil, and solvent products were stored on wooden pallets or metal racks. The storage area was in operation from

1983-84 until 1988. During the site visit, extensive staining and asphalt deterioration were observed. There were no containment berms around the area and no drains in the immediate vicinity. The area also had a leaking electrical generator on the opposite side of the area. Product storage has been moved to the Hazardous Waste Storage Area (Bldg. 134) and the area has been cleaned up.

A JP-4 fuel spill occurred on the apron in January 1978. Approximately 25 gallons of fuel were spilled due to a refueling valve malfunction. The Base Fire Department responded by diluting and flushing the fuel into the sewer system.

The second JP-4 fuel spill occurred in July 1978 when approximately 500 gallons was released from a C-130 aircraft. The Springfield Hazmat Response Team responded by containing, neutralizing, and flushing the fuel into the sewer system.

The Base is currently supplied by the City of Springfield which obtains its water from 10 100-foot wells in the north part of the city on Eagle City Road. Prior to early 1988, the Base was supplied by two water wells. The first well was abandoned in place in the early 1950s due to inadequate volume. The second well was disconnected and abandoned in place in 1988 when the Base changed to the municipal water supply in order to comply with the 1990 requirements of the Clean Water Act (CWA).

No hazardous or radioactive waste landfills/disposal areas have been operated at the Base.

There are no PCB transformers or other items containing PCBs at the Base.

<u>STATION</u>:

The Station has two OWSs located at AGE and Motor Vehicle Maintenance. The OWSs have never been serviced and the AGE OWS is not in use since it is filled to capacity. See Figure 6B, p. IV-16 for their locations.

The Station has always been supplied by the Cincinnati Water Works which obtains its water from the Ohio River at California, Ohio. Within 1989, the water source will also be a well field in Butler County, 15 to 20 miles west of Blue Ash.

There are no water wells on Station property.

The Station has four USTs; three located at Motor Pool and one located at AGE. A UST inventory is included as Appendix E, and the locations are shown on Figure 6B, p. IV-16.

There are no PCB transformers or other items containing PCBs at the Station.

No hazardous or radioactive waste landfills/disposal areas have been operated at the Station.

No FTAs have been operated at the Station.

V. CONCLUSIONS

BASE:

Information obtained through interviews with 19 past and present Base personnel, review of Base records, and field observations has resulted in the identification of six potential HM/HW disposal and/or spill sites on Base property. These sites consist of the following:

Site No. 1 - Fire Training Area 1
Site No. 2 - Fire Training Area 2
Site No. 3 - Leach Field and Outfall
Site No. 4 - POL Spill
Site No. 5 - Ramp Drainage Ditch
Site No. 6 - Mess Hall Underground Storage Tank Oil Spill

Each of these sites is potentially contaminated with HM/HW and each exhibit the potential for contaminant migration to groundwater and surface water. Therefore, these sites were assigned a HAS according to HARM.

STATION:

Information obtained through interviews with three present Station personnel, review of Station records, and field observations has resulted in the identification of two potential HM/HW disposal and/or spill sites on Station property. These sites consist of the following:

Site No. 7 - Diesel Fuel Spill
Site No. 8 - Leach Field

Each of these sites is potentially contaminated with HM/HW and each exhibits the potential for contaminant migration to groundwater and surface water. Therefore, these sites were assigned a HAS according to HARM.

VI. RECOMMENDATIONS

BASE:

Further IRP investigations are recommended in accordance with applicable regulations for each of the identified sites.

Site No. 1 - Fire Training Area 1
Site No. 2 - Fire Training Area 2
Site No. 3 - Leach Field and Outfall
Site No. 4 - POL Spill
Site No. 5 - Ramp Drainage Ditch
Site No. 6 - Mess Hall Underground Storage Tank Oil Spill

STATION:

Further IRP investigations are recommended in accordance with applicable regulations for each of the identified sites.

Site No. 7 - Diesel Fuel Spill
Site No. 8 - Leach Field

GLOSSARY OF TERMS

ALLUVIAL - Pertaining to or composed of alluvium, or deposited by a stream or running water; e.g., an "alluvial clay" or an "alluvial divide."

ALLUVIAL DEPOSITS - A general term for clay, silt, sand, gravel, or similar unconsolidated material deposited during comparatively recent geologic time by a stream or running water.

ALLUVIUM - A general term for clay, silt, sand, gravel, or similar unconsolidated material deposited during comparatively recent geologic time by a stream or running water.

ALUM - a mineral: $KAl(SO_4)_2 \cdot 12H_2O$, it is colorless or white and has a sweet-sour astringent taste.

ALUMINA - Aluminum oxide, Al_2O_3, occurring abundantly in silicate materials.

AMERICAN BALD EAGLE (Haliacetus leucocephalus) - A very large diurnal bird of prey, dark brown with head, neck and tail white, the national emblem of the United States.

ANNUAL PRECIPITATION - The total amount of rainfall and snowfall for the year.

AQUICLUDE - A confining bed that prevents the flow of water to or from an adjacent aquifer.

AQUIFER - A geologic formation, or group of formations, that contains sufficient saturated permeable material to conduct groundwater and to yield economically significant quantities of groundwater to wells and springs.

BEDROCK - A general term for the rock, usually solid, that underlies soil or other unconsolidated, superficial material.

BOTTOM LAND [geog] - Low-lying, level land, usually highly fertile, esp. in Mississippi Valley region. Syn: bottom(s).

BOULDER - A detached rock mass larger than a cobble, having a diameter greater than 256 mm, being somewhat rounded or otherwise distinctly shaped by abrasion in the course of transport.

BURIED VALLEY - A depression in an ancient land surface or in bedrock, now covered by younger deposits; esp. a preglacial valley filled with glacial drift.

CALCAREOUS - Said of a substance that contains calcium carbonate.

CAP-ROCK [eco geol] - A synonym of overburden, usually used for consolidated material.

CARBONATE - To impregnate or charge with carbon dioxide.

CLAY [soil] - A rock or mineral particle in the soil having a diameter less than 0.002 mm (2 microns).

CLAY [geol] - A rock or mineral fragment or a detrital particle of any composition smaller than a fine silt grain, having a diameter less than 1/256 mm (4 microns).

CLAY LOAM - A soil containing 27 to 40% clay, 20 to 45% sand and the remainder silt.

CONCRETIONS - A hard, compact mass or aggregate of mineral matter, normally subspherical but commonly oblate, disk-shaped, or irregular with odd or fantastic outlines; formed by precipitation from aqueous solution about a nucleus or center, in pores of sedimentary or fragmental volcanic rock, and usually of a composition widely different from that rock in which it is found and from which it is rather sharply separated.

CONTAMINANT - As defined by Section 101(f)(33) of Superfund Amendments and Reauthorization Act of 1986 (SARA) shall include, but not be limited to any element, substance, compound, or mixture, including disease-causing agents, which after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any organism, either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions (including malfunctions in reproduction), or physical deformation in such organisms or their offspring; except that the term "contaminant" shall not include petroleum, including crude oil or any fraction thereof which is not otherwise specifically listed or designated as a hazardous substance under:

(a) any substance designated pursuant to Section 311(b)(2)(A) of the Federal Water Pollution Control Act,

(b) any element, compound, mixture, solution, or substance designated pursuant to Section 102 of this Act,

(c) any hazardous waste having the characteristics identified under or listed pursuant to Section 3001 of the Solid Waste Disposal Act (but not including any waste the regulation of which under the Solid Waste Disposal Act has been suspended by Act of Congress),

(d) any toxic pollutant listed under Section 307(a) of the Federal Water Pollution Control Act,

(e) any hazardous air pollutant listed under Section 112 of the Clean Air Act, and

(f) any imminently hazardous chemical substance or mixture with respect to which the administrator has taken action pursuant to Section 7 of the Toxic Substance Control Act;

and shall not include natural gas, liquefied natural gas, or synthetic gas cf pipeline quality (or mixtures of natural gas and such synthetic gas).

CREEK - A term generally applied to any natural stream of water, normally larger than a brook but smaller than a river.

CRINOIDAL - Consisting almost entirely of the fossil skeletal parts of crinoids (pelmatozoan echinoderm - disk or globular body enclosed by calcareous plates from which the appendages extend radially) in which the plates are cemented with clear calcite.

CRITICAL HABITAT - The specific areas within the geographical area occupied by the species on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management consideration or protection.

CRYSTALLINE [petrol] - Said of a rock consisting wholly of crystals or fragments of crystals.

DEPOSITS - Earth material of any type, either consolidated or unconsolidated, that has accumulated by some natural process oragent.

DOLOMITE [rock] - A carbonate sedimentary rock of which more than 50% by weight or by areal percentages under the microscope consists of the mineral dolomite, or a variety of limestone or marble rich in magnesium carbonate.

DOLOSTONE - A term proposed by Shrock in 1948 for the sedimentary rock dolomite, in order to avoid confusion with the mineral of the same name.

DRIFT [glac geol] - A general term applied to all rock material (clay, silt, sand, gravel, boulders) transported by a glacier and deposited directly by or from the ice, or by running water emanating from a glacier. Drift includes unstratified material (till) and stratified deposits.

DRAINAGE CLASS [natural] - Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained - Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.
Somewhat excessively drained - Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.
Well drained - Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained - Water is removed from the soil somewhat slowly during some periods. moderately well drained soils are wet for only a short time during the growing season, but peridocially for long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or peridocially receive high rainfall, or both.
Somewhat poorly drained - Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.
Poorly drained - Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough periods during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.
Very poorly drained - Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients, as for example in "hillpeats" and "climatic moors."

ELEVATION [surv] - The vertical distance from a datum (usually mean sea level) to a point or object on the Earth's surface; esp. the height of a ground point above sea level.

EMULSIFIER - A substance that suspends fatty or resinous substances in minute globules in a liquid mixture.

ENDANGERED SPECIES - Any species which is in danger of extinction throughout all or a significant portion of its range, other than a species of the Class Insecta determined by the secretary to constitute a pest whose protection would present an overwhelming and overriding risk to man.

ETHYLENE GLYCOL - A colorless, sweetish alcohol $C_2H_4(OH)_2$, formed by decomposing certain ethylene compounds and used as an antifreeze mixture, lubricant, etc.

FINE [sed] - Very small particles, esp. those smaller than the average in a mixture of particles of various sizes.

FLASH POINT - The lowest temperature at which the vapors of combustible liquids, especially fuels, will ignite.

FLOOD PLAIN - The surface or strip of relatively smooth land adjacent to a river channel, constructed by the present river in its existing regimen and covered with water when the river overflows its banks.

FORMATION - A lithologically distinctive, mappable body of rock.

FOSSILIFEROUS - Containing fossils.

FRAGIPAN - A dense subsurface layer of soil whose hardness and relative slow permeability to water are chiefly due to extreme compactness rather than to high clay content (as in claypan) or cementation (as in hard pan).

FRIABLE - (a) Said of a soil consistency in which moist soil material crushes easily under gentle to moderate pressure and coheres when pressed together; (b) Said of a rock or mineral that crumbles naturally or is easily broken, pulverized or reduced to a powder.

GLACIAL - (a) Of or relating to the presence and activities of ice or glaciers, (b) Pertaining to distinctive features and materials produced or derived from glaciers and ice sheets.

GLACIAL DRIFT - See DRIFT.

GLACIAL TILL - See TILL.

GRADIENT [geomorph] - A degree of inclination, or rate of ascent or descent, of an inclined part of the Earth's surface with respect to the horizontal.

GRADIENT [hydraul] - See HYDRAULIC GRADIENT.

GRAVEL - An unconsolidated, natural accumulation of rounded rock fragments resulting from erosion, consisting predominantly of particles larger than sand, such as boulders, cobbles, pebbles, granules or any combination of these fragments.

GROUNDWATER - Refers to the subsurface water that occurs beneath the water table in soils and geologic formations that are fully saturated.

HARM - Hazard Assessment Rating Methodology - A system adopted and used by the United States Air Force to develop and maintain a priority listing of potentially contaminated sites on installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts. (Reference: DEQPPM 81-5, 11 December 1981.)

HAS - Hazard Assessment Score - The score developed by using the Hazardous Assessment Rating Methodology (HARM).

HAZARDOUS MATERIAL - Any substance or mixture of substances having properties capable of producing adverse effects on the health and safety of the human being. Specific regulatory definitions also found in OSHA and DOT rules.

HAZARDOUS WASTE - A solid or liquid waste that, because of its quantity, concentration, or physical, chemical, or infectious characteristics may:

a. cause, or significantly contribute to, an increase in mortality or an increase in serious or incapacitating reversible illness, or

b. pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

HIGHLAND - A general term for a relatively large area of elevated or mountainous land standing prominently above adjacent low areas; and mountainous region.

HILL - A natural elevation of the land surface, rising rather prominently above the surrounding land, usually of limited extent and having a well defined outline (rounded) and generally considered to be less than 1,000 feet from base to summit.

HUMID [climate] - Containing vapor or water; moist; damp.

ICE SHEET - A glacier of considerable thickness and more than 50,000 sq. km. in area, forming a continuous cover of ice and show over a land surface, spreading outward in all directions and not confined by the underlying topography; a continental glacier.

IGNEOUS ROCKS - Rock or mineral that has solidified from molten or partially molten material, i.e. from a magma.

IGNITABILITY - The ability of a substance to burn or catch fire.

ILLINOIAN - Pertaining to the classical third glacial stage of the Pleistocene Epoch in North America.

IMPERVIOUS - Incapable of being passed through, as by moisture or light rays; impenetrable.

INDIANA BAT - A nocturnal flying manual (Myotis sodalis), having greatly elongated forelimbs and digits that support a thim membrane extending to the hind limbs and sometimes to the tail.

INTERBEDDED - Beds lying between or alternating with others of different character; esp rock material laid down in sequence between other beds.

INTERSTRATIFIED - See INTERBEDDED.

IRON [mineral] - A heavy, magnetic, malleable and ductile, and chemically active mineral, the native metallic element Fe.

JP-4 - A type of jet fuel.

LAKE - Any inland body of standing water occupying a depression in the Earth's surface, generally of appreciable size (larger than a pond) and too deep to allow land plants to take root across the expanse of water.

LENS - A geologic deposit bounded by converging surfaces (at least one of which is curved), thick in the middle and thinning out toward the edges, resembling a convex lens. A lens may be double-convex or plano-convex.

LIME - Calcium oxide, CaO.

LIMESTONE - A sedimentary rock consisting primarily of calcium carbonate, primarily in the form of the mineral calcite.

LOAM - A rich, permeable soil composed of a friable mixture of relatively equal proportions of sand, silt, and clay particles, and usually containing organic matter.

LOWLAND - A general term for low-lying land or an extensive region of low land, especially near the coast and including the extended plains or country lying not far above tide level.

MAGNESIA - Magensium oxide, MgO, a light, white powder.

MEAN LAKE EVAPORATION - The total evaporation amount for a particular area; amount based on precipitation and climate (humidity).

MEK - Methyl ethyl ketone, used as a paint stripper/solvent.

MORAINE - A mound, ridge, or other distinct accumulation of unsorted, unstratified glacial drift, predominantly till, deposited chiefly by direct action of glacier ice, in a variety of topographic landforms that are independent of control by the surface on which the drift lies.

MOTTLED [soil] - a soil that is irregularly marked with spots or patches of different colors, usually indicating poor aeration or seasonal wetness.

NET PRECIPITATION - Precipitation minus evaporation.

OXIDE - A mineral compound characterized by the linkage of oxygen with one or more metallic elements.

PALEOZOIC - An era of geologic time, from the end of the Precambrian to the beginning of the Mesozoic, or from 570 to about 225 million years ago.

PD-680 - A cleaning solvent composed predominately of mineral spirits; Stod- dard solvent.

PEBBLE - A gereral term for a small, roundish stone; a rock fragment larger than a granule and smaller than a cobble; having the diameter in range of 4-64 mm (1/6 to 2.5 in).

PERENNIAL STREAM - A stream or reach of a stream that flows continuously throughout the year.

PERMEABILITY - The capacity of a porous rock, sediment, or soil for transmitting a fluid without impairment of the structure of the medium; it is a measure of the relative ease of fluid flow under unequal pressure.

PESTICIDE - A chemical or other substance used to destroy plant and animal pests.

PHASED [sed] - A product of deposition during a single fluctuation in the competency of the transporting agent.

PHYSIOGRAPHIC PROVINCE - Region of similar structure and climate that has had a unified geomorphic history.

PLASTIC [adj] - Capable of being molded; pliable.

PLATEAU [geomorph] - Broadly, any comparatively flat area of great extent and elevations.

POROUS - Having pores; permeable by fluids or light.

RADIOACTIVITY - Spontaneous nuclear disintegration of certain elements and isotopes, with the emission of radiation, radiant energy capable of affecting living tissue.

RANGE - Any series of contiguous townships aligned north and south and numbered consecutively east and west from a principal meridian (e.g. range 4 east). See SECTION, TOWNSHIP.

RIVER - A general term for a natural freshwater surface stream of considerable volume and a permanent or seasonal flow, moving in a definite channel toward a sea, lake, or another river.

ROCK - An aggregate of one or more minerals; or a body of undifferentiated mineral matter or of solid organic material.

RUNNING BUFFALO CLOVER (genus Trifolium) - A leguminous plant having a dense flower head and trifoliate leaves.

SAND - A rock or mineral particle in the soil, having a diameter in the range 0.52 - 2 mm.

SECTION - One of the 36 units of a subdivision of a township, representing a piece of land one mile square. See RANGE, TOWNSHIP.

SEDIMENT - Solid fragmental material that originates from weathering of rocks and is transported or deposited by air, water, or ice, or that accumulates by other natural agents, such as chemical precipitation from solution or secretion by organisms, and that forms in layers on the Earth's surface at ordinary temperatures in a loose, unconsolidated form; (b) strictly solid material that has settled down from a state of suspension in a liquid.

SEDIMENTARY ROCK - A rock resulting in the consolidation of loose sediment that has accumulated in layers; e.g., a clastic rock (such as conglomerate or tillite) consisting of mechanically formed fragments of older rock transported from its source and deposited in water or from air or ice; or a chemical rock (such as rock salt or gypsum) formed by precipitation from solution; or an organic rock (such as certain limestones) consisting of the remains or secretions of plants and animals.

SEMI-CRYSTALLINE - Said of the texture of a porphyritic igneous rock in which crystalls and glassy groundmass are equal or nearly equal in volumetric proportions. Syn: hyalocrystalline.

SHALE - A fine-grained detrital sedimentary rock, formed by the consolidation (esp. by compression) of clay, silt, or mud.

SILICA - The chemically resistant dioxide of silicon: SiO_2.

SILURIAN - A period of the Paleozoic era, thought to have covered the span of time between 440 and 400 million years ago; also the corresponding system of rocks.

SILT [geol] - A rock fragment or detrital particle smaller than a very fine sand grain and larger than coarse clay, having a diameter in the range of 0.004 to 0.063 mm.

SILT [soil] - (a) A rock or mineral particle in the soil, having a diameter in the range 0.002-0.005 mm; (b) A soil containing more than 80% silt-size particles, less than 12% clay, and less than 20% sand.

SILT LOAM - A soil containing 50 - 88% silt, 0 - 27% clay and 0 - 50% sand.

SILTY CLAY - A soil containing 40-6-% clay, 40-60% silt, and less than 20% sand.

SLOPE - (a) Gradient; (b) The inclined surface of any part of the Earth's surface.

SOAPSTONE [rock] - A metamorphic rock of massive, schistose, or interlaced fibrous or flaky texture and soft, unctuous feel, composed essentially of talc with varying amounts of micas, chlorite, amphibolite, pyroxenes, etc. and derived from the alteration of ferromagnesium silicate minerals.

SOIL PERMEABILITY - The characteristic of the soil that enables water to move downward through the profile. Permeability is measured as to the number of inches per hour that water moves downward through the saturated soil.

Terms describing permeability are:

Very Slow	- less than 0.06 inches per hour (less than 4.24×10^{-5} cm/sec)
Slow	- 0.06 to 0.20 inches per hour (4.24×10^{-5} to 1.41×10^{-4} cm/sec)
Moderately Slow	- 0.20 to 0.63 inches per hour (1.41×10^{-4} cm/sec to 4.45×10^{-4} cm/sec)
Moderate	- 0.63 to 2.00 inches per hour (4.45×10^{-4} to 1.41×10^{-3} cm/sec)

Moderately Rapid - 2.00 to 6.00 inches per hour (1.41×10^{-3} to 4.24×10^{-3} cm/sec)

Rapid - 6.00 to 20.00 inches per hour (4.24×10^{-3} to 1.41×10^{-2} cm/sec)

Very Rapid - more than 20.00 inches per hour (more than 1.41×10^{-2} cm/sec)

(Reference: U.S.D.A. Soil Conservation Service)

SOIL REACTION - The degree of acidity of alkalinity of a soil, expressed in pH values. A soil that tests of pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity of alkalinity is expressed as:

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

SOIL STRUCTURE - The arrangement of primary soil particles into compound particles or aggregates that are separated from adjoining aggregates. The principal forms of soil structure are -- platty (laminated), prismatic (vertical axis of aggregates longer than horizontal), columnar (prisms with rounded tops), blocky (angular or subangular), and granular. Structureless soils are either single grained (each grain by itself, as in dune sand) or massive (the particles adhering without any regular cleavage, as in many hardpans).

SOLVENT - A substance, generally a liquid, capable of dissolving other substances.

SPRING - A place where water flows naturally from a rock or the soil onto the land surface or into a body of surface water.

STRATA - Distinguishable horizontal rock layers separated vertically from other layers.

STRATIFIED - Formed, arranged, or laid down in layers or strata; especially said of any layered sedimentary rock or deposit.

STREAM - Any body of running water that moves under gravity to progressively lower levels, in a relatively narrow but clearly defined channel on the surface of the ground; smaller than river; Syn : brook.

SUBSTRATUM [soil] - Any layer beneath the solum (the upper part of a soil profile).

SUBSURFACE - Rock and soil material lying beneath the Earth's surface.

SURFACE WATER - All water exposed at the ground surface, including streams, rivers, ponds, and lakes.

SURFICIAL - Pertaining to, or occuring on, a surface. Syn: superficial.

TCA - Trichloroethane, used as a solvent.

TEMPERATE [climate] - Moderate as regards to temperature; free from extremes of heat or cold; mild.

TERRACE [geomorph] - Any long, narrow, relatively level or gently inclined surface, generally less broad than a plain, bounded along one edge by a steeper descending slope and along the other by a steeper ascending slope. A terrace commonly occurs along the margin and above the level of a body of water, marking a former water level.

TERRACE [soil] - A horizontal or gently sloping ridge or embankment of earth built along the contours of a hillside for the purpose of conserving moisture, reducing erosion, or controlling runoff.

TERRANE - A rock or group of rocks and the area in which the outcrop.

THREATENED SPECIES - Any species which is likely to become an endangered species within the foreseeable future throughout all or significant portion of its range.

TILL - Dominantly unsorted and unstratified drift, generally unconsolidated, deposited directly by and underneath a glacier without subsequent reworking by meltwater, and consisting of a heterogenous mixture of clay, silt, sand and gravel and boulders ranging widely in size and shape

TOXICITY - The degree of intensity of a poison; toxicity can be evaluated using the rating scheme of Sax (1984):

Sax's Toxicity Ratings

0 = no toxicity (None)

Substances that cause no harm under any conditions or substances that cause toxic effects under the most unusual conditions or by overwhelming doses.

1 = slight toxicity (Low)

Substances that produce changes in the human body which are readily reversible and which will disappear following termination of exposure.

2 = moderate toxicity (Moderate)

Substances that may produce irreversible as well as reversible changes in the human body. These changes are not of such severity as to threaten life or to produce serious physical impairment.

3 = severe toxicity (High)

Substances that produce irreversible changes in the human body. These changes are of such severity to threaten human life or cause death.

TOPOGRAPHY - The general conformation of a land surface, including its relief and the position of its natural and manmade features.

TOWNSHIP - The unit of survey of the U.S. Public Land Survey, representing a piece of land that is bounded on the east and west by meridians approximately 6 miles apart and on the north and south by parallels six miles apart, and that is normally divided into 36 sections. Townships are located with references to a principal meridian and base line, and are normally numbered consecutively north and south from the base line (e.g. "township 14 north"). Used in conjuction with range.

VARSOL - A mineral spirit, used as a solvent.

WATER TABLE - The surface between the zone of saturation and the zone of aeration; that surface of a body of unconfined groundwater at which the pressure is equal to that of the atmosphere.

WETLANDS - Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

WILDERNESS AREA - An area unaffected by anthropogenic activities and deemed worthy of special attention to maintain its natural condition.

WISCONSINAN - Pertaining to the classical fourth glacial stage of Pleistocene epoch in North America.

BIBLIOGRAPHY

Federal Insurance Rate Map. City of Blue Ash. 390208001-0004. July 1987.

Federal Insurance Rate Map. Clark County Ohio. 3907320325A. July 1987.

Fuller, M.L. and F.G. Clapp. "The Underground Waters of South-Western Ohio." U.S.G.S. Water-Supply Paper 259. U.S. Government Printing Office. Washington, D.C. 1912

Geological Survey of Ohio. Reports. Volume 1. U.S. Geological Survey. Nevins & Meyers. Columbus, OH. 1873.

Klaer, Fred H. Jr. and David G. Thompson "Groundwater Resources of the Cincinnati Area, Butler and Hamilton Counties, Ohio." Geological Survey Water-Supply Paper 999. U.S. Geological Survey. Washington, D.C. 1948.

National Oil and Hazardous Substances Contingency Plan, Subpart H. 47 Federal Register 31219. 16 July 1982.

Norris, Stanley E. and Andrew M. Spieker. "Groundwater Resources of the Dayton Area, Ohio." Geological Survey Water-Supply Paper 1808. U.S. Geological Survey. Washington, D.C. 1966.

Schmidt, James J. and Douglas E. Keen. Groundwater Resources of Clark County - Map. Ohio Department of Natural Resources. Division of Water. Columbus, Ohio, 1982.

Soil Conservation Service. Soil Survey of Hamilton County, Ohio. Department of Agriculture. Washington, D.C. 1982.

U.S. Bureau of Soils. Soil Survey of Clark County, Ohio. Department of Agriculture. Washington, D.C. 1958.

Walker, Alfred C. and David S. Orr. Groundwater Resources of Hamilton County - Map. Ohio Department of Natural Resources. Division of Water. Columbus, Ohio, 1986.

APPENDIX A

Resumes of HMTC Preliminary Assessment Team

NATASHA M. BROCK

EDUCATION

Graduate work, civil/environmental engineering, University of Maryland, 1987-present

Graduate work, civil/environmental engineering, University of Delaware, 1985-1986

B.S. (cum laude), environmental science, University of the District of Columbia, 1984

Undergraduate work, biology, The American University, 1978-1980

CERTIFICATION

Health & Safety Training Level C

EXPERIENCE

Three years' experience in the environmental and hazardous waste field. Work performed includes remedial investigations/feasibility studies, RCRA facility assessments, comprehensive monitoring evaluations, and remedial facility investigations. Helped develop and test biological and chemical processes used in minimization of hazardous and sanitary waste generation. Researched multiple substrate degradation using aerobic and anaerobic organisms.

EMPLOYMENT

Dynamac Corporation (1987-present): Environmental Scientist

In working for Dynamac's Hazardous Materials Technical Center (HMTC), performs Preliminary Assessments, Remedial Investigations and Feasibility Studies (PA/RI/FS) under the Air National Guard Installation Restoration Program. Specifically involved in determining rates and extent of contamination, recommending groundwater monitoring procedures, and soil sampling and analysis procedures. In the process of preparing standard operating procedure manuals for quick remedial response to site spills and releases, and PA/RI/FS.

C.C. Johnson & Malhotra, P.C. (1986-1987): Environmental Scientist

Involved as part of a team in performing Remedial Investigations/Feasibility Studies (RI/FS) for EPA Regions I and IV under Resource Conservation and Recovery Act (RCRA) work assignments for REM II projects. Participated on a team involved in RCRA Facility Assessments (RFAs), Comprehensive Monitoring Evaluations (CMEs), and Remedial Facility Investigations (RFIs) for EPA work assignments under RCRA for REM III projects in Regions I and IV. Work included solo oversight observations of field sampling and facility inspections. Additional responsibilities included promotion work, graphic layout, data entry-quality check for various projects. Certified Health & Safety Training Level C.

Work Force Temporary Services (1985-1986): Research Scientist

In working for DuPont's Engineering Test Center, helped in the development and testing of laboratory-scale biological and chemical processes for a division whose main purpose was to reduce the amount of hazardous waste generated. Also worked for Hercules, Inc., with a group involved in polymer use for wastewater treatment for clients in various industrial fields. Specifically involved in product consultation, troubleshooting, and product development.

National Oceanic and Atmospheric Administration (1982-1984): Research Assistant

Involved with an information gathering and distribution center of weather impacts worldwide. Specifically involved in data collection, distribution of data to clients, assessment production and special reports.

RAYMOND G. CLARK, JR.

EDUCATION

Completed graduate engineering courses, George Washington University, 1957
B.S., Mechanical Engineering, University of Maryland, 1949

SPECIALIZED TRAINING

Grad. European Command Military Assistance School, Stuttgart, 1969
Grad. Army Psychological Warfare School, Fort Bragg, 1963
Grad. Sanz School of Languages, D.C., 1963
Grad. DOD Military Assistance Institute, Arlington, 1963
Grad. Defense Procurement Management Course, Fort Lee, 1960
Grad. Engineer Officer's Advanced Course, Fort Belvoir, 1958

CERTIFICATIONS

Registered Professional Engineer: Kentucky (#4341); Virginia (#8303); Florida (#36228)

EXPERIENCE

Thirty-one years of experience in engineering design, planning and management including construction and construction management, environmental, operations and maintenance, repair and utilities, research and development, electrical, mechanical, master planning and city management. Over six years' logistical experience including planning and programming of military assistance materiel and training for foreign countries, serving as liaison with American private industry, and directing materiel storage activities in an overseas area. Over two years' experience as an engineering instructor. Extensive experience in personnel management, cost reduction programs, and systems improvement.

EMPLOYMENT

Dynamac Corporation (1986-present): Program Manager/Department Manager

Responsible for activities relating to Preliminary Analysis, Site Investigations, Remedial Investigations, Feasibility Studies, and Remedial Action for the Installation Restoration Program for the U.S. Air Force, Air National Guard, Bureau of Prisons, and the U.S. Coast Guard, including records search, review and evaluation of previous studies; preparation of statements of work, feasibility studies; preparation of remedial action plans, designs and specifications; review of said studies/plans to ensure that they are in conformance with requirements; review of environmental studies and reports; preparation of Air Force Installation Restoration Program Management Guidance; and preparation of Part B permits.

Howard Needles Tammen & Bergendoff (HNTB) (1981-1986): Manager

Responsible, as Project Manager, for: design of a new concourse complex at Miami International Airport to include terminal building, roadway system, aircraft apron, drainage channel relocation, satellite building with underground pedestrian tunnel, and associated underground utility corridors, to include subsurface aircraft fueling systems, with an estimated construction cost of $163 million; a cargo vehicle tunnel under the crosswind runway with an estimated construction cost of $15 million; design and construction of two large corporate jet aircraft hangars; and for the hydrocarbon recovery program to include investigation, analysis, design of recovery systems, monitoring of recovery systems, and planning and design of residual recovery systems utilizing biodegradation. Participated, as sub-consultant, in Air Force IRP seminar.

HNTB (1979-1981): Airport Engineer

Responsibilities included development of master plan for Iowa Air National Guard base; project initiation assistance for a new regional airport in Florida; engineering assistance for new facilities design and construction for Maryland Air National Guard; master plan for city maintenance facilities, Orlando, Florida; in-country master plan and preliminary engineering project management for Madrid, Spain, International Airport; and project management of master plan for Whiting Naval Air Station and outlying fields in Florida.

HNTB (1974-1979): Design Engineer

Responsibilities included development of feasibility and site selection studies for reliever airports in Cleveland and Atlanta; site selection and facilities requirements for the Office of Aeronautical Charting and Cartography, NOAA; and onsite mechanical and electrical engineering design for terminal improvements at Baltimore-Washington International Airport, Maryland.

HNTB (1972-1974): Airport Engineer

Responsible for development of portions of the master plan and preliminary engineering for a new international airport for Lisbon, Portugal, estimated to cost $250 million.

Self-employed (1971-1972): Private Consultant

Responsible for engineering planning and installation of a production line for multimillion-dollar contract in Madrid, Spain, to fabricate transmissions and differentials for U.S. Army vehicles.

U.S. Army, Corps of Engineers (1969-1971): Chief, Materiel & Programs

Directed materiel planning and military training programs of military assistance to the Spanish Army. Controlled arrival and acceptance of materiel by host government. Served as liaison/advisor to American industry interested

in conducting business with Spanish government. Was Engineer Advisor to Spanish Army Construction, Armament and Combat Engineers, also the Engineer Academy and Engineer School of Application.

Corps of Engineers (1968-1969): Chief, R&D Branch, OCE

Directed office responsible to Chief of Engineers for research and development. Developed research studies in new concepts of bridging, new explosives, family of construction equipment, night vision equipment, expedient airfield surfacing, expedient aircraft fueling systems, water purification equipment and policies, prefabricated buildings, etc. Achieved Department of Army acceptance for development and testing of new floating bridge. Participated in high-level Department Committee charged with development of a Tactical Gap Crossing Capability Model.

Corps of Engineers (1967-1968): Division Engineer

Facilities engineer in Korea. Was fully responsible for management and maintenance of 96 compounds within 245 square miles including 6,000+ buildings, 1 million linear feet of electrical distribution lines, 18 water purification and distribution systems, sanitary sewage disposal systems, roads, bridges, and fire protection facilities with real property value of more than $256 million. Planned and developed the first five-year master plan for this area. Administered $12 million budget and $2 million engineer supply operation. Was in responsible charge of over 500 persons. Developed and obtained approval for additional projects worth $9 million for essential maintenance and repair. Directed cost reduction programs that produced more than $500,000 savings to the United States in the first year.

Corps of Engineers (1963-1967): Engineer Advisor

Engineer and aviation advisor to the Spanish Army. Developed major modernization program for Spanish Army Engineers, including programming of modern engineer and mobile maintenance equipment. Directed U.S. portion of construction, testing and acceptance of six powder plants, one shell loading facility, an Engineer School of Application, and depot rebuild facilities for engineer, artillery, and armor equipment. Planned and developed organization of a helicopter battalion for the Spanish Army. Responsible for sales, delivery, assembly and testing of 12 new nelicopters in country. Provided U.S. assistance to unit until self-sufficiency was achieved. Was U.S. advisor to Engineer Academy, School of Application and Polytechnic Institute.

Corps of Engineers (1960-1963): Deputy District Engineer

Responsible for planning and development of extensive construction projects in the Ohio River Basin for flood control and canalization, including dam, lock, bridge, and building construction, highway relocation, watershed studies, real estate acquisitions and dispositions. Was contracting officer for more than $75

million of projects per year. Supervised approximately 1,300 personnel, including 300 engineers. Planned and directed cost reduction programs amounting to more than $200,000 per year. Programmed and controlled development of a modern radio and control net in a four-state area.

Corps of Engineers (1959-1960): Area Engineer

Directed construction of a large airfield in Ohio as Contracting Officer's representative. Assured that all construction (runway, steam power plant, fuel transfer and loading facilities, utilities, buildings, etc.) complied with terms of plans and specifications. Was onsite liaison between Air Force and contractors.

Corps of Engineers (1958-1959): Chief, Supply Branch

Managed engineer supply yard containing over $21 million construction supplies and engineer equipment. Directed in-storage maintenance, processing and deprocessing of equipment. Achieved complete survey of items on hand, a new locator system and complete rewarehousing, resulting in approximately $159,000 savings in the first year.

Corps of Engineers (1957-1958): Student

U.S. Army Engineer School, Engineer Officer's Advanced Course.

Corps of Engineers (1954-1957): Engineer Manager

Managed engineer construction projects and was assigned to staff and faculty of the Engineer School. Was in charge of instruction on engineer equipment utilization, management and maintenance. Directed Electronic Section of the school. Coordinated preparation of five-year master plan for the Department of Mechanical and Technical Equipment.

Corps of Engineers (1949-1954): Engineer Commander

Positions of minor but increasing importance and responsibility in engineering management, communications, demolitions, construction administration and logistics.

PROFESSIONAL AFFILIATIONS

Member, National Society of Professional Engineers
Fellow, Society of American Military Engineers
Member, American Society of Civil Engineers
Member, Virginia Engineering Society
Member, Project Management Institute

HARDWARE

IBM PC

SOFTWARE

Lotus 1-2-3, D Base III Plus, Framework, Project Scheduler 5000, Harvard Project Manager, Volkswriter, Microsoft Project

MARK D. JOHNSON

EDUCATION

B.S., Geology, James Madison University, 1980

EXPERIENCE

Eight years' technical and management experience including geologic mapping, subsurface investigations, foundation inspections, groundwater monitoring, pumping and observation well installation, geotechnical instrumentation, groundwater assessment, preparation of Air Force Installation Restoration Program Guidance, preparation of statements of work for environmental field monitoring and feasibility studies for the Air Force and the Air National Guard, development of environmental field monitoring programs, and preparation of Preliminary Assessments for the Air National Guard.

EMPLOYMENT

Dynamac Corporation (1984-present): Senior Staff Scientist/Geologist

Primarily responsible for developing and managing technical support programs relevant to CERCLA related activities for the Air Force, Air National Guard, Department of Justice and Coast Guard. These activities include Statements of Work for Site Investigations (SI), Remedial Investigations (RI), and Feasibility Studies (FS); assessing groundwater at hazardous waste disposal/spill sites for the purpose of determining rates and extents of contaminant migration and for developing SI and RI programs and identifying remedial actions; reviewing SI, RI and FS contractor work plans for various government clients, developing technical and contractual requirements for SI, RI and FS projects, managing the development and preparation of Preliminary Assessments, and assisting clients in the development of their environmental management programs, which included preparation of the Air Force's Installation Restoration Program Management Guidance document.

Bechtel Associates Professional Corporation (1981-1984): Geologist

Performed the following duties in conjunction with major civil engineering projects including subways, nuclear power plants and buildings: prepared geologic maps of surface and subsurface facilities in rock and soil including tunnels, foundations and vaults; assessed groundwater conditions in connection with construction activities and groundwater control systems; monitored the installation of permanent and temporary dewatering systems and observation wells; monitored surface and subsurface settlement of tunnels; and participated in subsurface investigations.

Schnabel Engineering Associates (1981): Geologist

Inspected foundations and backfill placement.

PROFESSIONAL CREDENTIALS

Registered Professional Geologist, South Carolina, #116, 1987

PROFESSIONAL AFFILIATIONS

Association of Engineering Geologists
National Water Well Association/Association of Ground Water Scientists and Engineers

BETSY A. BRIGGS

EDUCATION

B.S., Biology and Chemistry, State University College of New York at Cortland, 1979

Completed several courses in M.B.A. program, University of Phoenix, Denver, Colorado Division, 1984

SPECIALIZED TRAINING

Hazardous Waste Management course, Air Force Institute of Technology, 1986

CERTIFICATION

Certified Hazardous Materials Manager, Institute of Hazardous Materials Management, 1985

SECURITY CLEARANCE

Secret/DOE

EXPERIENCE

Nine years of experience including three years in hazardous waste management, two years as an environmental engineer, two years as an ecologist, and two years in laboratory research. Has conducted ambient air quality monitoring programs, critical pathways projects to study movement of radioactive materials in the environment, metallurgic laboratory analyses, and independent studies in biology and chemistry. Currently provides managerial oversight and technical support to a hazardous waste program for the Air Force.

EMPLOYMENT

Dynamac Corporation (1985-present): Program Manager/Hazardous Waste Specialist

Primary responsibility as program manager is to oversee and manage up to 44 field personnel involved in RCRA and CERCLA work in support of the U.S. Air Force. Other duties include performing preliminary assessments/site surveys for the Air National Guard, marketing and proposal preparation, and preparing and providing training in preparation for the Certified Hazardous Materials Manager examination.

As hazardous waste specialist the primary responsibility was to manage the hazardous waste program at Myrtle Beach Air Force Base. Duties included:

- Reviewing the design and specifications of various base construction projects and overseeing such projects to ensure compliance with all applicable state and federal hazardous waste regulations. Projects under design included a corrosion control facility, TSD facility, two accumulation points, and a parts cleaning vat system. Construction project oversight included the final inspection of the entomology building to ensure that the facility was equipped for proper storage, usage and disposal of pesticides; removal of materials contaminated with pesticides, PCBs, petroleum products, and solvents from six sites; asbestos removal and disposal from a former hangar site; and the removal of two underground storage tanks, one of which was leaking.
- Conducting surveys of hazardous waste generating activities.
- Advising on need for and methods of minimizing hazardous waste generation.
- Writing and maintaining hazardous waste management plan.
- Preparing hazardous waste management reports and documents required by state and federal law.
- Maintaining liaison with federal and state regulatory agencies on matters involving criteria, standards, performance specifications, and monitoring.
- Providing information and technical consultation to Air Force installation staff regarding hazardous materials and hazardous waste operations.
- Serving as ad hoc advisor to environmental contingency response teams.

Rockwell International (1982-1984): Environmental Engineer

Primary responsibility was collection, evaluation, and reporting of ambient air monitoring data. Other responsibilities included technical assistance for monitoring total suspended solids in ambient air. Also performed data collection and reduction of air effluent emission control activities.

Environmental monitoring and control programs are to ensure that all Department of Energy and other governmental effluent regulations are met, and that plant effluents are consistent with the As Low As Reasonably Achievable (ALARA) Principle. Monthly and Annual Reports summarize the effluent and environmental monitoring programs.

Rockwell International (1980-1982): Ecologist

Responsible for planning, organizing, and leading critical pathways projects designed to study the movement of radioactive materials throughout the environment. Projects were: (1) general critical pathway evaluation to identify

sampling points possibly not considered in present monitoring program; (2) plant uptake versus plant uptake plus foliar deposition measurement study; (3) deer tissue analysis program; and (4) food stuff monitoring program. Progress and results were published in semiannual reports.

Colorado School of Mines Research Institute, Texas Gulf Research Laboratory (1979-1980): Senior Laboratory Technician

Work involved quantitative analysis of platinum, palladium, and silver in soil samples. Analysis included sample preparation, fire assays, calorimetric procedures, and smelt tests.

State University College of New York at Cortland (1978-1979): Undergraduate Independent Study

Project involved the isolation of trail pheromone from spun silk of *Hyphantria* (fall webworm). Included organic and inorganic extraction procedures and performing bioassays. Also worked on production of synthetic diet comparable to fresh leaf diet for *Malacosomo* (eastern tent caterpillar).

PUBLICATIONS

Hazardous Waste Management Survey for Myrtle Beach Air Force Base, Hazardous Materials Technical Center, Rockville, Maryland, 1986 and 1988.

Hazardous Waste Management Plan for Myrtle Beach Air Force Base, Hazardous Materials Technical Center, Rockville, Maryland, 1987 and 1988.

Waste Minimization Guidance for Myrtle Beach Air Force Base, Hazardous Materials Technical Center, Rockville, Maryland, 1988.

Underground Storage Tank Management Plan for Myrtle Beach Air Force Base, Hazardous Materials Technical Center, Rockville, Maryland, 1988.

Annual Environmental Monitoring Report, Rockwell International, Energy Systems Group, Rocky Flats Plant, 1982 and 1983.

Environmental Studies Group Semiannual Report, Rockwell International, Energy Systems Group, Rocky Flats Plant, June/December of 1980 and 1981.

TECHNICAL PRESENTATIONS

PCB Management, Myrtle Beach Air Force Base, 1987.

Underground Storage Tank Regulations/History, Myrtle Beach Air Force Base, 1986.

Overview of the Hazardous Waste Training Program, Myrtle Beach Air Force Base, 1985.

Overview of the Environmental Studies Group, Nevada Test Site and Rockwell International at Hanford, Washington, 1981.

NAICHIA YEH

EDUCATION

Ph.D., Environmental Sciences, The University of Texas at Dallas, 1987
M.S., Environmental Sciences, The University of Texas at Dallas, 1984
B.S., Physics, National Taiwan Normal University, 1978

EXPERIENCE

Nine years of combined academic and technical experience in hazardous waste management and in supplying technology-based solutions to environmental problems, including environmental assessment and evaluation of the nature and the potential environmental impacts of hazardous waste. Has extensive knowledge in computer-aided modeling methodology.

EMPLOYMENT

<u>Dynamac Corporation (1987-present)</u>: Environmental Scientist

Conducts preliminary assessments of suspected hazardous materials/hazardous waste sites at military installations in order to identify, and evaluate potentially hazardous waste disposal sites. Also, quantifies contamination at these sites and analyzes the data in order to determine both short-term and long-term public health effect as well as future risks that may result from exposure to the site contaminants.

Provides technical information consultation to clients with inquiries regarding state-of-the-art technology, current regulations and hazards associated with usage of hazardous materials. Also provides guidance on proper transportation and disposal methods of hazardous wastes, safe storage and handling for hazardous materials, and hazards associated with chemicals and substances.

Provides computerized management services support for environmental contracts to the Hazardous Material Management Division of the Dynamac Corporation. Conducts scientific data processing and data analysis, and develops databases for managing work assignments and contracts.

Developed an electronic hazardous assessment rating system which is a fully computerized version of the U.S. Air Force Hazardous Assessment Rating System. Designed a technical inquiry data base system to keep track of the technical inquiry service requests received by the Hazardous Materials Technical Center operated by Dynamac Corporation. Implemented an efficient methodology for preparing the project expense reports to support program management functions.

The University of Texas at Dallas (1985-1987): Research Assistant

Participated in an environmental assessment and design project which involved the evaluation of the nature and potential impact of hazardous waste. This project included the design of field and laboratory programs for the collection of data used with computer-aided modeling, the site assessment of the proposed hazardous waste facilities, the field sampling and hazardous waste characterization, the zoning of polluted site, the design of remedial cleanup program, and the conceptual design of the hazardous waste disposal plan based on the onsite investigation and computer modeling results.

The University of Texas at Dallas (1984-1985): Computer Laboratory Consultant

Instructed students in microcomputer application and computer programming languages. Conducted scientific data processing and data analysis. Developed a regression analysis program with Lotus 1-2-3. The program integrates five regression mechanisms and takes full advantage of Lotus 1-2-3's keyboard macro and graphic abilities.

The University of Texas at Dallas (1983): Teaching Assistant

Taught numerical analysis and applied mathematics in environmental engineering.

Peitou High School (1979, 1982): Science Teacher

Taught physics, mathematics, computer sciences, and environmental education.

ROC Army (1980-1981): Research Scientist

Conducted environmental surveys and evaluations.

HARDWARE

IBM 360/370., IBM 4341, IBM 4381, IBM PC/XT/AT, IBM PS/2 and compatibles, TI Professional, TI 59, TI 990, and Apple computer family

SOFTWARE

Wylber, Music, CMS, SAS, MS-DOS, CP/M, and various PC-based software systems such as Lotus 1-2-3, DBaseIII^{+}, plus different graphics and data communication utilities; languages used include FORTRAN, BASIC, PL/1, and Pascal

APPENDIX B

Outside Agency Contact List

OUTSIDE AGENCY CONTACT LIST

1. U.S. Geological Survey
   12201 Sunrise Valley Drive
   Reston, VA 22092
   Library

2. U.S. Fish and Wildlife Services - Ohio Division
   6950-H Americana Parkway
   Renoldsburg, OH 43068
   614-469-6923

3. U.S. Soil Conservation Service - Ohio
   200 N. High St. Rm. 522
   Columbus, Ohio 43215
   614-469-6962

4. Ohio Department of Natural Resources
   Div. of Water - Flood Plain Unit
   1939 Fountain Square
   Bldg. E3
   Columbus, Ohio 43224
   614-265-6755

5. Ohio Department of Natural Resources
   Div. of Water - Groundwater
   1939 Fountain Square
   Bldg. E3
   Columbus, Ohio 43224
   614-265-6739

6. Ohio Department of Natural Resources
   Div. of Water - Surface Water
   1939 Fountain Square
   Bldg. E3
   Columbus, Ohio 43224
   614-265-6578

7. Cincinnati Water Works
   4747 Spring Grove Avenue
   Cincinnati, Ohio 45232
   513-352-4643

8. City of Springfield Treatment Plant
   201 Eagle City Road
   Springfield, Ohio 45502

9. Ohio Department of Natural Resources
   Div. of Geological Survey
   1939 Fountain Square
   Bldg. Bl
   Columbus, Ohio 43224

APPENDIX C

USAF Hazard Assessment Rating Methodology and Guidelines

USAF HAZARD ASSESSMENT RATING METHODOLOGY

The Department of Defense (DoD) has established a comprehensive program to identify, evaluate, and control problems associated with past disposal practices at DoD facilities. One of the actions required under this program is to:

> develop and maintain a priority listing of contaminated installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts (Reference: DEQPPM 81-5, 11 December 1981).

Accordingly, the United States Air Force (USAF) has sought to establish a system to set priorities for taking further actions at sites based upon information gathered during the Preliminary Assessment phase of its Installation Restoration Program (IRP).

PURPOSE

The purpose of the site rating model is to provide a relative ranking of sites of suspected contamination from hazardous substances. This model will assist the Air National Guard in setting priorities for follow-on site investigations.

This rating system is used only after it has been determined that (1) potential for contamination exists (hazardous wastes present in sufficient quantity), and (2) potential for migration exists. A site can be deleted from consideration for rating on either basis.

DESCRIPTION OF MODEL

Like the other hazardous waste site ranking models, the U.S. Air Force's site rating model uses a scoring system to rank sites for priority attention. However, in developing this model, the designers incorporated some special features to meet specific DoD program needs.

The model uses data readily obtained during the Preliminary Assessment portion of the IRP. Scoring judgment and computations are easily made. In assessing the hazards at a given site, the model develops a score based on the most likely routes of contamination and the worst hazards at the site. Sites are given low scores only if there are clearly no hazards. This approach meshes well with the policy for evaluating and setting restrictions on excess DoD properties.

Site scores are developed using the appropriate ranking factors according to the method presented in the flow chart (Figure 1 of this report). The site rating form and the rating factor guideline are provided at the end of this appendix.

As with the previous model, this model considers four aspects of the hazard posed by a specific site: possible receptors of the contamination, the waste and its characteristics, the potential pathways for contaminant migration, and any efforts that were made to contain the wastes resulting from a spill.

The receptors category rating is based on four rating factors: the potential for human exposure to the site, the potential for human ingestion of contaminants should underlying aquifers be polluted, the current and anticipated uses of the surrounding area, and the potential for adverse effects upon important biological resources and fragile natural settings. The potential for human exposure is evaluated on the basis of the total population within 1,000 feet of the site, and the distance between the site the the base boundary. The potential for human ingestion of contaminants is based on the distance between the site and the nearest well, the groundwater use of the uppermost aquifer, and population served by the groundwater supply within 3 miles of the site. The uses of the surrounding area are determined by the zoning within a 1-mile radius. Determination of whether or not critical environments exist within a 1-mile radius of the site predicts the potential for adverse effects from the site upon important biological resources and fragile natural settings. Each rating factor is numerically evaluated (0-3) and increased by a multiplier. The maximum possible score is also computed. The factor score and maximum possible scores are totaled, and the receptors subscore computed as follows: receptors subscore = (100 x factor score subtotal/maximum score subtotal).

The waste characteristics category is scored in three stages. First, a point rating is assigned based on an assessment of the waste quantity and the hazard (worst case) associated with the site. The level of confidence in the information is also factored into the assessment. Next, the score is multiplied by a waste persistence factor, which acts to reduce the score if the waste is not very persistent. Finally, the score is further modified by the physical state of the waste. Liquid wastes receive the maximum score, while scores for sludges and solids are reduced.

The pathways category rating is based on evidence of contaminant migration or an evaluation of the highest potential (worst case) for contaminant migration along one of three pathways: surface-water migration, flooding, and groundwater migration. If evidence of contaminant migration exists, the category is given a subscore of 80 to 100 points. For indirect evidence, 80 points are assigned, and for direct evidence, 100 points are assigned. If no evidence is found, the highest score among the three possible routes is used. The three pathways are evaluated and the highest score among all four of the potential scores is used.

The scores for each of the three categories are added together and normalized to a maximum possible score of 100. Then the waste management practice category is scored. Scores for sites with no containment can be reduced by 5 percent. If a site is contained and well managed, its score can be reduced by 90 percent. The final site score is calculated by applying the waste management practices category factor to the sum of the scores for the other three categories.

HAZARDOUS ASSESSMENT RATING METHODOLOGY GUIDELINES

I. RECEPTORS CATEGORY

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
A. Population within 1,000 feet (includes on-base facilities)	0	1-25	26-100	Greater than 100	4
B. Distance to nearest water well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet	10
C. Land Use/Zoning (within 1-mile radius)	Completely remote (zoning not applicable)	Agricultural	Commercial or Industrial	Residential	3
D. Distance to installation boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet	6
E. Critical environments (within 1-mile radius)	Not a critical environment	Natural areas	Pristine natural areas; minor wetlands; preserved areas; presence or economically important natural resources susceptible to contamination	Major habitat of an endangered or threatened species; presence of recharge area major wetlands	10
F. Water quality/use designation of nearest surface water body	Agricultural or Industrial use	Recreation, propagation and management of fish and wildlife	Shellfish propagation and harvesting	Potable water supplies	6
G. Ground-water use of uppermost aquifer	Not used, other sources readily available	Commercial, industrial, or irrigation, very limited other water sources	Drinking water, municipal water available	Drinking water, no municipal water available; commercial, industrial, or irrigation, no other water source available	9
H. Population served by surface water supplies within 3 miles downstream of site	0	1-50	51-1,000	Greater than 1,000	6
I. Population served by aquifer supplies within 3 miles of site	0	1-50	51-1,000	Greater than 1,000	6

II. WASTE CHARACTERISTICS

A-1 Hazardous Waste Quantity

S = Small quantity (5 tons or 20 drums of liquid)
M = Moderate quantity (5 to 20 tons or 21 to 85 drums of liquid)
L = Large quantity (20 tons or 85 drums of liquid)

A-2 Confidence Level of Information

C = Confirmed confidence level (minimum criteria below)

o Verbal reports from interviewer (at least 2) or written information from the records

o Knowledge of types and quantities of wastes generated by shops and other areas on base

S = Suspected confidence level

o No verbal reports or conflicting verbal reports and no written information from the records

Logic based on the knowledge of the types and quantities of hazardous wastes generated at the base, and a history of past waste disposal practices indicate that these wastes were disposed of at a site

A-3 Hazard Rating

Rating Factors	Rating Scale Levels 0	1	2	3
Toxicity	Sax's Level 0	Sax's Level 1	Sax's Level 2	Sax's Level 3
Ignitability	Flash point greater than 200° F	Flash point at 140° F to 200° F	Flash point at 80° F to 140° F	Flash point less than 80° F
Radioactivity	At or below background levels	1 to 3 times background levels	3 to 5 times background levels	Over 5 times background levels

Use the highest individual rating based on toxicity, ignitability and radioactivity and determine the hazard rating.

Hazard Rating	Points
High (H)	3
Medium (M)	2
Low (L)	1

Waste Characteristics Matrix

Point Rating	Hazardous Waste Quantity	Confidence Level of Information	Hazard Rating
100	L	C	H
	L	C	M
80	M	C	H
70	L	S	H
60	S	C	H
	M	C	M
	L	S	M
50	L	C	L
	M	S	H
	S	C	M
	S	S	H
40	M	S	M
	M	C	L
	L	S	L
	S	C	L
30	M	S	L
	S	S	M
20	S	S	L

Notes:

For a site with more than one hazardous waste, the waste quantities may be added using the following rules:

Confidence Level

- o Confirmed confidence levels (C) can be added.
- o Suspected confidence levels (S) can be added.
- o Confirmed confidence levels cannot be added with suspected confidence levels.

Waste Hazard Rating

- o Wastes with the same hazard rating can be added.
- o Wastes with different hazard ratings can only be added *in a downgrade mode*, e.g., MCM + SCH = LCM if the total quantity is greater than 20 tons.

Example: Several wastes may be present at a site, each having an MCM designation (60 points). By adding the quantities of each waste, the designation may change to LCM (80 points). In this case, the correct point rating for the waste is 80.

B. Persistence Multiplier for Point Rating

Multiply Point Rating Persistence Criteria	From Part A by the Following
Metals, polycyclic compounds, and halogenated hydrocarbons	1.0
Substituted and other ring compounds	0.9
Straight chain hydrocarbons	0.8
Easily biodegradable compounds	0.4

C. Physical State Multiplier

Physical State	Multiply Point Total From Parts A and B by the Following
Liquid	1.0
Sludge	0.75
Solid	0.50

III. PATHWAYS CATEGORY

A. Evidence of Contamination

Direct evidence is obtained from laboratory analyses of hazardous contaminants present above natural background levels in surface water, ground water, or air. Evidence should confirm that the source of contamination is the site being evaluated.

Indirect evidence might be from visual observation (i.e. leachate), vegetation stress, sludge deposits, presence of taste and odors in drinking water, or reported discharges that cannot be confirmed as resulting from the site, but the site is greatly suspected of being a source of contamination.

B-1 Potential for Surface Water Contamination

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
Distance to nearest surface water (including drainage ditches and storm sewers)	Greater than 1 mile	2,001 feet to 1 mile	501 feet to 2,000 feet	0 to 500 feet	8
Net precipitation	Less than -10 inches	-10 to +5 inches	+5 to +20 inches	Greater than +20 inches	6
Surface erosion	None	Slight	Moderate	Severe	8
Surface permeability	0% to 15% clay ($>10^{-2}$ cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	Greater than 50% clay ($<10^{-6}$ cm/sec)	6
Rainfall intensity based on 1-year 24-hour rainfall (Number of thunderstorms)	<1.0 inch (0-5)	1.0 to 2.0 inches (5-35)	2.1 to 3.0 inches (36-49)	>3.0 inches (>50)	8

B-2 Potential for Flooding

Rating Factors	0	1	2	3	Multiplier
Floodplain	Beyond 100-year floodplain	In 100-year floodplain	In 10-year floodplain	Floods annually	1

B-3 Potential for Ground-Water Contamination

Rating Factors	0	1	2	3	Multiplier
Depth to groundwater	Greater than 500 feet	50 to 500 feet	11 to 50 feet	0 to 10 feet	8
Net precipitation	Less than -10 inches	-10 to +5 inches	+5 to +20 inches	Greater than +20 inches	8
Soil permeability	Greater than 50% clay ($<10^{-6}$ cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	0% to 15% clay ($>10^{-2}$ cm/sec)	8
Subsurface flows	Bottom of site greater than 5 feet above high ground-water level	Bottom of site occasionally submerged	Bottom of site frequently submerged	Bottom of site located below mean ground water level	8

B 3 Potential for Ground Water Contamination Continued

Rating Factors	Rating Scale Levels 0	1	2	3	Multiplier
Direct access to groundwater (through faults, fractures, faulty well casings, subsidence, fissures, etc.)	No evidence of risk	Low risk	Moderate risk	High risk	8

IV. WASTE MANAGEMENT PRACTICES CATEGORY

A. *This category adjusts the total risk as determined from the receptors, pathways, and waste characteristics categories for waste management practices and engineering controls designed to reduce this risk. The total risk is determined by first averaging the receptors, pathways, and waste characteristics subscores.*

B. Waste Management Practices Factor

The following multipliers are then applied to the total risk points (from A):

Waste Management Practice	Multiplier
No containment	1.0
Limited containment	0.95
Fully contained and in ull compliance	0.10

Guidelines for fully contained:

Landfills:

- o Clay cap or other impermeable cover
- o Leachate collection system
- o Liners in good condition
- o Adequate monitoring wells

Spills:

- o Quick spill cleanup action taken
- o Contaminated soil removed
- o Soil and/or water samples confirm total cleanup of the spill

Surface Impoundments:

- o Liners in good condition
- o Sound dikes and adequate freeboard
- o Adequate monitoring wells

Fire Protection Training Areas:

- o Concrete surface and berms
- o Oil/water separator for pretreatment of runoff
- o Effluent from oil/water separator to treatment plant

General Note: If data are not available or known to be complete the factor ratings under items I A through I, III-B-1, or III 6 3, then leave blank for calculation of factor score and maximum possible score.

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE ____________________

LOCATION ____________________

DATE OF OPERATION OR OCCURRENCE ____________________

OWNER/OPERATOR ____________________

COMMENTS/DESCRIPTION ____________________

SITE RATED BY ____________________

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site		4		
B. Distance to nearest well		10		
C. Land use/zoning within 1 mile radius		3		
D. Distance to installation boundary		6		
E. Critical environments within 1 mile radius of site		10		
F. Water quality of nearest surface water body		6		
G. Ground water use of uppermost aquifer		9		
H. Population served by surface water supply within 3 miles downstream of site		6		
I. Population served by ground-water supply within 3 miles of site		6		
		Subtotals	______	______

Receptors subscore (100 X factor score subtotal/maximum score subtotal) ______

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) ______
2. Confidence level (C - confirmed, S - suspected) ______
3. Hazard rating (H - high, M - medium, L - low) ______

Factor Subscore A (from 20 to 100 based on factor score matrix) ______

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

______ X ______ = ______

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

______ X ______ = ______

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ________

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		
Net precipitation		6		
Surface erosion		8		
Surface permeability		6		
Rainfall intensity		8		
Subtotals			______	______

Subscore (100 X factor score subtotal/maximum score subtotal) ______

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 X factor score/3) ______

3. Ground water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water		8		
Net precipitation		6		
Soil permeability		8		
Subsurface flows		8		
Direct access to ground water		8		
Subtotals			______	______

Subscore (100 X factor score subtotal/maximum score subtotal) ______

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore ______

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors ______
Waste Characteristics ______
Pathways ______

Total ________ divided by 3 = ______
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

__________ X __________ = ______

APPENDIX D

Site Factor Rating Criteria and Hazardous Assessment Rating Forms

178th Tactical Fighter Group
Ohio Air National Guard
Springfield-Beckley Municipal Airport
Springfield, Ohio

USAF Hazard Assessment Rating Methodology
Factor Rating Criteria

1. RECEPTORS CATEGORY	RATING SCALE LEVEL	NUMERICAL VALUE
Population within 1,000 feet of site:		
Site No. 1	Greater than 100	3
Site No. 2	Greater than 100	3
Site No. 3	Greater than 100	3
Site No. 4	Greater than 100	3
Site No. 5	Greater than 100	3
Site No. 6	Greater than 100	3
Distance to nearest well:		
Site No. 1	0 to 3,000 feet	3
Site No. 2	0 to 3,000 feet	3
Site No. 3	0 to 3,000 feet	3
Site No. 4	0 to 3,000 feet	3
Site No. 5	0 to 3,000 feet	3
Site No. 6	0 to 3,000 feet	3
Land use/zoning within 1 mile radius:	Agricultural	1
Distance Base boundary:		
Site No. 1	0 to 1,000 feet	3
Site No. 2	0 to 1,000 feet	3
Site No. 3	0 to 1,000 feet	3
Site No. 4	0 to 1,000 feet	3
Site No. 5	0 to 1,000 feet	3
Site No. 6	0 to 1,000 feet	3
Critical environments within 1 mile:	Not a critical environment	0
Water quality of nearest surface water body:	Agricultural or Industrial use	0
Groundwater use of uppermost aquifer:	Drinking water, municipal water available	2

178th Tactical Fighter Group
Ohio Air National Guard
Springfield-Beckley Municipal Airport
Springfield, Ohio

USAF Hazard Assessment Rating Methodology
Factor Rating Criteria

1. RECEPTORS CATEGORY (Cont'd)	RATING SCALE LEVEL	NUMERICAL VALUE
Population served by surface water supply within 3 miles downstream of site:	51 to 1,000	2
Population served by groundwater supply within 3 miles of site:	51 to 1,000	2

2. WASTE CHARACTERISTICS

Quantity:

Site No. 1	Large quantity	L
Site No. 2	Large quantity	L
Site No. 3	Small quantity	S
Site No. 4	Small quantity	S
Site No. 5	Small quantity	S
Site No. 6	Small quantity	S

Confidence Level:

Site No. 1	Confirmed	C
Site No. 2	Confirmed	C
Site No. 3	Confirmed	C
Site No. 4	Confirmed	C
Site No. 5	Confirmed	C
Site No. 6	Confirmed	C

Hazard Rating:

Toxicity

Site No. 1	Sax Level 3	3
Site No. 2	Sax Level 3	3
Site No. 3	Sax Level 3	3
Site No. 4	Sax Level 3	3
Site No. 5	Sax Level 2	2
Site No. 6	Sax Level 3	3

178th Tactical Fighter Group
Ohio Air National Guard
Springfield-Beckley Municipal Airport
Springfield, Ohio

USAF Hazard Assessment Rating Methodology
Factor Rating Criteria

2. WASTE CHARACTERISTICS (Cont'd)	RATING SCALE LEVEL	NUMERICAL VALUE
Hazard Rating: (Cont'd)		
Ignitability		
Site No. 1	Flashpoint less than 80°F	3
Site No. 2	Flashpoint less than 80°F	3
Site No. 3	Flashpoint less than 80°F	3
Site No. 4	Flashpoint less than 80°F	3
Site No. 5	Flashpoint at 140° to 200°F	1
Site No. 6	Flashpoint less than 80°F	3
Radioactivity		
Site No. 1	At or below background levels	0
Site No. 2	At or below background levels	0
Site No. 3	At or below background levels	0
Site No. 4	At or below background levels	0
Site No. 5	At or below background levels	0
Site No. 6	At or below background levels	0
Persistence Multiplier		
Site No. 1	Metals, polycyclicompounds and halogenated compounds	1.0
Site No. 2	Metals, polycyclicompounds and halogenated compounds	1.0
Site No. 3	Metals, polycyclic compounds and halogenated compounds	1.0
Site No. 4	Straight chain hydrocarbon	0.8
Site No. 5	Straight chain hydrocarbon	0.8
Site No. 6	Straight chain hydrocarbon	0.8
Physical State Multiplier		
Site No. 1	Liquid	1.0
Site No. 2	Liquid	1.0
Site No. 3	Liquid	1.0
Site No. 4	Liquid	1.0
Site No. 5	Liquid	1.0
Site No. 6	Liquid	1.0

178th Tactical Fighter Group
Ohio Air National Guard
Springfield-Beckley Municipal Airport
Springfield, Ohio

USAF Hazard Assessment Rating Methodology
Factor Rating Criteria

3. PATHWAYS CATEGORY	RATING SCALE LEVEL	NUMERICAL VALUE
Surface Water Migration		
Distance to nearest surface water:		
Site No. 1	501 feet to 2,000 feet	2
Site No. 2	501 feet to 2,000 feet	2
Site No. 3	501 feet to 2,000 feet	2
Site No. 4	501 feet to 2,000 feet	2
Site No. 5	501 feet to 2,000 feet	2
Site No. 6	501 feet to 2,000 feet	2
Net precipitation:	-10 to +5 inches	1
Surface erosion:	Slight	1
Surface permeability:	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	2
Rainfall intensity:	2.1 to 3.0 inches	2
Flooding:	Beyond 100-year floodplain	0
Groundwater Migration		
Depth to groundwater:	11 to 50 feet	2
Net precipitation:	-10 to +5 inches	1
Soil permeability:	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	1
Subsurface flow:	Bottom of site greater than 5 feet above high groundwater level	0
Direct access to groundwater:	No evidence of risk	0

178th Tactical Fighter Group
Ohio Air National Guard
Springfield-Beckley Municipal Airport
Springfield, Ohio

USAF Hazard Assessment Rating Methodology
Factor Rating Criteria

4. WASTE MANAGEMENT PRACTICES CATEGORY	RATING SCALE LEVEL	NUMERICAL VALUE
Practice:		
Site No. 1	No containment	1.0
Site No. 2	No containment	1.0
Site No. 3	No containment	1.0
Site No. 4	No containment	1.0
Site No. 5	No containment	1.0
Site No. 6	No containment	1.0

123rd Tactical Control Flight
Ohio Air National Guard
Blue Ash ANG Station
Cincinnati, Ohio

USAF Hazard Assessment Rating Methodology
Factor Rating Criteria

1. RECEPTORS CATEGORY	RATING SCALE LEVEL	NUMERICAL VALUE
Population within 1,000 feet of site:		
Site No. 7	Greater than 100	3
Site No. 8	Greater than 100	3
Distance to nearest well:		
Site No. 7	3,000 feet to 1 miles	2
Site No. 8	3,000 feet to 1 miles	2
Land use/zoning within 1 mile radius:	Residential	3
Distance Base boundary:		
Site No. 7	0 to 1,000 feet	3
Site No. 8	0 to 1,000 feet	3
Critical environments within 1 mile:	Not a critical environment	0
Water quality of nearest surface water body:	Recreation, propagation and management of fish and wildlife	1
Groundwater use of uppermost aquifer:	Not used, other sources readily available	0
Population served by surface water supply within 3 miles downstream of site:	Greater than 1,000	3
Population served by groundwater supply within 3 miles of site:	0	0

123rd Tactical Control Flight
Ohio Air National Guard
Blue Ash ANG Station
Cincinnati, Ohio

USAF Hazard Assessment Rating Methodology
Factor Rating Criteria

2. WASTE CHARACTERISTICS CATEGORY	RATING SCALE LEVEL	NUMERICAL VALUE
Quantity:		
Site No. 7	Small quantity	S
Site No. 8	Small quantity	S
Confidence Level:		
Site No. 7	Confirmed confidence level	C
Site No. 8	Confirmed confidence level	C
Hazard Rating:		
Toxicity		
Site No. 7	Sax Level 3	3
Site No. 8	Sax Level 2	2
Ignitability		
Site No. 7	Flashpoint less than 80°F	3
Site No. 8	Flashpoint at 140°F to 200°F	1
Radioactivity		
Site No. 7	At or below background levels	0
Site No. 8	At or below background levels	0
Persistence Multiplier		
Site No. 7	Straight chain hydrocarbon	0.8
Site No. 8	Straight chain hydrocarbon	0.8
Physical State Multiplier		
Site No. 7	Liquid	1.0
Site No. 8	Liquid	1.0

123rd Tactical Control Flight
Ohio Air National Guard
Blue Ash ANG Station
Cincinnati, Ohio

USAF Hazard Assessment Rating Methodology
Factor Rating Criteria

3. PATHWAYS CATEGORY	RATING SCALE LEVEL	NUMERICAL VALUE
Surface Water Migration		
Distance to nearest surface water:		
Site No. 7	0 to 500 feet3	
Site No. 8	0 to 500 feet3	
Net precipitation:	-10 to +5 inches1	
Surface erosion:	Slight1	
Surface permeability:	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)1	
Rainfall intensity:	1.0 to 2.0 inches1	
Flooding:	Beyond 100-year floodplain0	
Groundwater Migration		
Depth to groundwater:	11 to 50 feet2	
Net precipitation:	-10 to +5 inches1	
Soil permeability:	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)1	
Subsurface flow:	Bottom of site greater than 5 feet above high groundwater level0	
Direct access to groundwater:	No evidence of risk0	

4. WASTE MANAGEMENT PRACTICES CATEGORY

Practice:

Site No. 7	No containment1.0
Site No. 8	No containment1.0

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE SITE NO. 1 - FIRE TRAINING AREA 1
LOCATION OHIO AIR NATIONAL GUARD, SPRINGFIELD, OHIO
DATE OF OPERATION/OCCURRENCE 1957 TO 1963
OWNER/OPERATOR 178TH TACTICAL FIGHTER GROUP
COMMENTS/DESCRIPTION
RATED BY HMTC

I. RECEPTORS

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
A. POPULATION WITHIN 1000 FEET OF SITE	:	3	4	12	12
B. DISTANCE TO NEAREST WELL	:	3	10	30	30
C. LAND USE/ZONING WITHIN 1 MILE RADIUS	:	1	3	3	9
D. DISTANCE TO INSTALLATION BOUNDARY	:	3	6	18	18
E. CRITICAL ENVIRONMENTS WITHIN 1 MILE RADIUS OF SITE	:	0	10	0	30
F. WATER QUALITY OF NEAREST SURFACE WATER	:	0	6	0	18
G. GROUND WATER USE OF UPPERMOST AQUIFER	:	2	9	18	27
H. POPULATION (WITHIN 3 MILES) SERVED BY					
DOWN STREAM SURFACE WATER	:	2	6	12	18
GROUND WATER	:	2	6	12	18
		SUBTOTALS		105	180

RECEPTORS SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL) 58

II. WASTE CHARACTERISTICS

A. SELECT THE FACTOR SCORE BASED ON THE ESTIMATED QUANTITY, THE DEGREE OF HAZARD, AND THE CONFIDENCE LEVEL OF THE INFORMATION.

1. WASTE QUANTITY (S=SMALL, M=MEDIUM, L=LARGE) (L)
2. CONFIDENCE LEVEL (S=SUSPECT, C=CONFIRM) (C)
3. HAZARD RATING (L=LOW, M=MEDIUM, H=HIGH) (H)

FACTOR SUBSCORE A (100)
(FROM 20 TO 100 BASED ON FACTOR SCORE MATRIX)

B. APPLY PERSISTENCE FACTOR

FACTOR SUBSCORE A x PERSISTENCE FACTOR SUBSCORE B
(100)(1) = (100)

C. APPLY PHYSICAL STATE MULTIPLIER

SUBSCORE B x PHYSICAL STATE MULTIPLIER = WASTE CHARACTERISTICS SUBSCORE
(100)(1) = (100)

III. PATHWAY

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE

A. IF THERE IS EVIDENCE OF MIGRATION OF HAZARDOUS CONTAMINANTS, ASSIGN MAXIMUM FACTOR SUBSCORE OF (100 POINTS FOR DIRECT EVIDENCE) OR (80 POINTS FOR INDIRECT EVIDENCE). IF DIRECT EVIDENCE (100) EXISTS THEN PROCEED TO C. IF NO EVIDENCE OR INDIRECT EVIDENCE (LESS THEN 80) EXISTS, PROCEED TO B.
(80)

B. RATE THE MIGRATION POTENTIAL FOR 3 POTENTIAL PATHWAYS: SURFACE WATER MIGRATION, FLOODING, AND GROUND-WATER MIGRATION. SELECT THE HIGHEST RATING, AND PROCEED TO C.

1. SURFACE WATER MIGRATION

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
DISTANCE TO NEAREST SURFACE WATER	:	2	8	16	24
NET PRECIPITATION	:	1	6	6	18
SURFACE EROSION	:	1	8	8	24
SURFACE PERMEABILITY	:	2	6	12	18
RAINFALL INTENSITY	:	2	8	16	24
SUBTOTALS				58	108
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					54

2. FLOODING

		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
FLOODING		0	1	0	3
SUBSCORE (100 x FACTOR SCORE /3)	:				0

3. GROUND WATER MIGRATION

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
DEPTH TO GROUND WATER	:	2	8	16	24
NET PRECIPITATION	:	1	6	6	18
SOIL PERMEABILITY	:	1	8	8	24
SUBSURFACE FLOWS	:	0	8	0	24
DIRECT ACCESS TO GROUND WATER	:	0	8	0	24
SUBTOTALS				30	114
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					26

C. HIGHEST PATHWAY SUBSCORE

ENTER THE HIGHEST SUBSCORE VALUE FROM A, B-1, B-2 OR B-3 ABOVE.
(80)

IV. WASTE MANAGEMENT PRACTICES

A. AVERAGE THE THREE SUBSCORES FOR RECEPTORS, WASTE CHARACTERISTICS, AND PATHWAYS.

RECEPTORS	(58)
WASTE CHARACTERISTICS	(100)
PATHWAYS	(80)
TOTAL DIVIDED BY 3 = GROSS TOTAL SCORE	(79)

B. APPLY FACTOR FOR WASTE CONTAINMENT FROM WASTE MANAGEMENT PRACTICES

GROSS TOTAL SCORE x	WASTE MANAGEMENT PRACTICES FACTOR x		FINAL SCORE
(79)(	1)	=	79

=========

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE SITE NO. 2 - FIRE TRAINING AREA 2
LOCATION OHIO AIR NATIONAL GUARD, SPRINGFIELD, OHIO
DATE OF OPERATION/OCCURRENCE 1967 TO 1982
OWNER/OPERATOR 178TH TACTICAL FIGHTER GROUP
COMMENTS/DESCRIPTION
RATED BY HMTC

I. RECEPTORS

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
A. POPULATION WITHIN 1000 FEET OF SITE	:	3	4	12	12
B. DISTANCE TO NEAREST WELL	:	3	10	30	30
C. LAND USE/ZONING WITHIN 1 MILE RADIUS	:	1	3	3	9
D. DISTANCE TO INSTALLATION BOUNDARY	:	3	6	18	18
E. CRITICAL ENVIRONMENTS WITHIN 1 MILE RADIUS OF SITE	:	0	10	0	30
F. WATER QUALITY OF NEAREST SURFACE WATER	:	0	6	0	18
G. GROUND WATER USE OF UPPERMOST AQUIFER	:	2	9	18	27
H. POPULATION (WITHIN 3 MILES) SERVED BY					
DOWN STREAM SURFACE WATER	:	2	6	12	18
GROUND WATER	:	2	6	12	18
	SUBTOTALS			105	180

RECEPTORS SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL) 58

II. WASTE CHARACTERISTICS

A. SELECT THE FACTOR SCORE BASED ON THE ESTIMATED QUANTITY, THE DEGREE OF HAZARD, AND THE CONFIDENCE LEVEL OF THE INFORMATION.

1. WASTE QUANTITY (S=SMALL, M=MEDIUM, L=LARGE) (L)
2. CONFIDENCE LEVEL (S=SUSPECT, C=CONFIRM) (C)
3. HAZARD RATING (L=LOW, M=MEDIUM, H=HIGH) (H)

FACTOR SUBSCORE A (100)
(FROM 20 TO 100 BASED ON FACTOR SCORE MATRIX)

B. APPLY PERSISTENCE FACTOR

FACTOR SUBSCORE A x PERSISTENCE FACTOR = SUBSCORE B
(100)(1) = (100)

C. APPLY PHYSICAL STATE MULTIPLIER

SUBSCORE B x PHYSICAL STATE MULTIPLIER = WASTE CHARACTERISTICS SUBSCORE
(100)(1) = (100)

III. PATHWAY

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE

A. IF THERE IS EVIDENCE OF MIGRATION OF HAZARDOUS CONTAMINANTS, ASSIGN MAXIMUM FACTOR SUBSCORE OF <100 POINTS FOR DIRECT EVIDENCE> OR <80 POINTS FOR INDIRECT EVIDENCE>. IF DIRECT EVIDENCE <100> EXISTS THEN PROCEED TO C. IF NO EVIDENCE OR INDIRECT EVIDENCE <LESS THEN 80> EXISTS, PROCEED TO B.
(80)

B. RATE THE MIGRATION POTENTIAL FOR 3 POTENTIAL PATHWAYS: SURFACE WATER MIGRATION, FLOODING, AND GROUND-WATER MIGRATION. SELECT THE HIGHEST RATING, AND PROCEED TO C.

1. SURFACE WATER MIGRATION

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
DISTANCE TO NEAREST SURFACE WATER	:	2	8	16	24
NET PRECIPITATION	:	1	6	6	18
SURFACE EROSION	:	1	8	8	24
SURFACE PERMEABILITY	:	2	6	12	18
RAINFALL INTENSITY	:	2	8	16	24
SUBTOTALS				58	108
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					54

2. FLOODING

		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
2. FLOODING		0	1	0	3
SUBSCORE (100 x FACTOR SCORE /3)	:				0

3. GROUND WATER MIGRATION

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
DEPTH TO GROUND WATER	:	2	8	16	24
NET PRECIPITATION	:	1	6	6	18
SOIL PERMEABILITY	:	1	8	8	24
SUBSURFACE FLOWS	:	0	8	0	24
DIRECT ACCESS TO GROUND WATER	:	0	8	0	24
SUBTOTALS				30	114
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					26

C. HIGHEST PATHWAY SUBSCORE

ENTER THE HIGHEST SUBSCORE VALUE FROM A, B-1, B-2 OR B-3 ABOVE.
(80)

IV. WASTE MANAGEMENT PRACTICES

A. AVERAGE THE THREE SUBSCORES FOR RECEPTORS, WASTE CHARACTERISTICS, AND PATHWAYS.

RECEPTORS	(58)
WASTE CHARACTERISTICS	(100)
PATHWAYS	(80)
TOTAL DIVIDED BY 3 = GROSS TOTAL SCORE	(79)

B. APPLY FACTOR FOR WASTE CONTAINMENT FROM WASTE MANAGEMENT PRACTICES

GROSS TOTAL SCORE x	WASTE MANAGEMENT PRACTICES FACTOR x		FINAL SCORE
(79)	(1)	=	79

=========

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE	SITE NO. 3 - LEACH FIELD AND OUTFALL
LOCATION	OHIO AIR NATIONAL GUARD, SPRINGFIELD, OHIO
DATE OF OPERATION/OCCURRENCE	1955 TO 1982
OWNER/OPERATOR	178TH TACTICAL FIGHTER GROUP
COMMENTS/DESCRIPTION	
RATED BY	HMTC

I. RECEPTORS

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
A. POPULATION WITHIN 1000 FEET OF SITE	:	3	4	12	12
B. DISTANCE TO NEAREST WELL	:	3	10	30	30
C. LAND USE/ZONING WITHIN 1 MILE RADIUS	:	1	3	3	9
D. DISTANCE TO INSTALLATION BOUNDARY	:	3	6	18	18
E. CRITICAL ENVIRONMENTS WITHIN 1 MILE RADIUS OF SITE	:	0	10	0	30
F. WATER QUALITY OF NEAREST SURFACE WATER	:	0	6	0	18
G. GROUND WATER USE OF UPPERMOST AQUIFER	:	2	9	18	27
H. POPULATION (WITHIN 3 MILES) SERVED BY					
DOWN STREAM SURFACE WATER	:	2	6	12	18
GROUND WATER	:	2	6	12	18
		SUBTOTALS		105	180

RECEPTORS SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL) 58

II. WASTE CHARACTERISTICS

A. SELECT THE FACTOR SCORE BASED ON THE ESTIMATED QUANTITY, THE DEGREE OF HAZARD, AND THE CONFIDENCE LEVEL OF THE INFORMATION.

1. WASTE QUANTITY (S=SMALL, M=MEDIUM, L=LARGE) (S)
2. CONFIDENCE LEVEL (S=SUSPECT, C=CONFIRM) (C)
3. HAZARD RATING (L=LOW, M=MEDIUM, H=HIGH) (H)

FACTOR SUBSCORE A (50)
(FROM 20 TO 100 BASED ON FACTOR SCORE MATRIX)

B. APPLY PERSISTENCE FACTOR

FACTOR SUBSCORE A x PERSISTENCE FACTOR = SUBSCORE B
(50)(1) = (50)

C. APPLY PHYSICAL STATE MULTIPLIER

SUBSCORE B x PHYSICAL STATE MULTIPLIER = WASTE CHARACTERISTICS SUBSCORE
(50)(1) = (50)

III. PATHWAY

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE

A. IF THERE IS EVIDENCE OF MIGRATION OF HAZARDOUS CONTAMINANTS, ASSIGN MAXIMUM FACTOR SUBSCORE OF (100 POINTS FOR DIRECT EVIDENCE) OR (80 POINTS FOR INDIRECT EVIDENCE). IF DIRECT EVIDENCE (100) EXISTS THEN PROCEED TO C. IF NO EVIDENCE OR INDIRECT EVIDENCE (LESS THEN 80) EXISTS, PROCEED TO B.
(80)

B. RATE THE MIGRATION POTENTIAL FOR 3 POTENTIAL PATHWAYS: SURFACE WATER MIGRATION, FLOODING, AND GROUND-WATER MIGRATION. SELECT THE HIGHEST RATING, AND PROCEED TO C.

1. SURFACE WATER MIGRATION

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
DISTANCE TO NEAREST SURFACE WATER	:	2	8	16	24
NET PRECIPITATION	:	1	6	6	18
SURFACE EROSION	:	1	8	8	24
SURFACE PERMEABILITY	:	2	6	12	18
RAINFALL INTENSITY	:	2	8	16	24
SUBTOTALS				58	108
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					54

2. FLOODING

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
FLOODING		0	1	0	3
SUBSCORE (100 x FACTOR SCORE /3)	:				0

3. GROUND WATER MIGRATION

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
DEPTH TO GROUND WATER	:	2	8	16	24
NET PRECIPITATION	:	1	6	6	18
SOIL PERMEABILITY	:	1	8	8	24
SUBSURFACE FLOWS	:	0	8	0	24
DIRECT ACCESS TO GROUND WATER	:	0	8	0	24
SUBTOTALS				30	114
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					26

C. HIGHEST PATHWAY SUBSCORE

ENTER THE HIGHEST SUBSCORE VALUE FROM A, B-1, B-2 OR B-3 ABOVE.
(80)

IV. WASTE MANAGEMENT PRACTICES

A. AVERAGE THE THREE SUBSCORES FOR RECEPTORS, WASTE CHARACTERISTICS, AND PATHWAYS.

RECEPTORS	(58)
WASTE CHARACTERISTICS	(50)
PATHWAYS	(80)
TOTAL DIVIDED BY 3 = GROSS TOTAL SCORE	(63)

B. APPLY FACTOR FOR WASTE CONTAINMENT FROM WASTE MANAGEMENT PRACTICES

GROSS TOTAL SCORE x	WASTE MANAGEMENT PRACTICES FACTOR x		FINAL SCORE
63)(	1)	=	63

=========

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE — SITE NO. 4 - POL SPILL
LOCATION — OHIO AIR NATIONAL GUARD, SPRINGFIELD, OHIO
DATE OF OPERATION/OCCURRENCE 1972
OWNER/OPERATOR — 178TH TACTICAL FIGHTER GROUP
COMMENTS/DESCRIPTION
RATED BY — HMTC

I. RECEPTORS

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
A. POPULATION WITHIN 1000 FEET OF SITE	:	3	4	12	12
B. DISTANCE TO NEAREST WELL	:	3	10	30	30
C. LAND USE/ZONING WITHIN 1 MILE RADIUS	:	1	3	3	9
D. DISTANCE TO INSTALLATION BOUNDARY	:	3	6	18	18
E. CRITICAL ENVIRONMENTS WITHIN 1 MILE RADIUS OF SITE	:	0	10	0	30
F. WATER QUALITY OF NEAREST SURFACE WATER	:	0	6	0	18
G. GROUND WATER USE OF UPPERMOST AQUIFER	:	2	9	18	27
H. POPULATION (WITHIN 3 MILES) SERVED BY					
DOWN STREAM SURFACE WATER	:	2	6	12	18
GROUND WATER	:	2	6	12	18
	SUBTOTALS			105	180

RECEPTORS SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL) 58

II. WASTE CHARACTERISTICS

A. SELECT THE FACTOR SCORE BASED ON THE ESTIMATED QUANTITY, THE DEGREE OF HAZARD, AND THE CONFIDENCE LEVEL OF THE INFORMATION.

1. WASTE QUANTITY (S=SMALL, M=MEDIUM, L=LARGE) (S)
2. CONFIDENCE LEVEL (S=SUSPECT, C=CONFIRM) (C)
3. HAZARD RATING (L=LOW, M=MEDIUM, H=HIGH) (H)

FACTOR SUBSCORE A (50)
(FROM 20 TO 100 BASED ON FACTOR SCORE MATRIX)

B. APPLY PERSISTENCE FACTOR

FACTOR SUBSCORE A x PERSISTENCE FACTOR = SUBSCORE B
(50)(0.8) = (40)

C. APPLY PHYSICAL STATE MULTIPLIER

SUBSCORE B x PHYSICAL STATE MULTIPLIER = WASTE CHARACTERISTICS SUBSCORE
(40)(1) = (40)

III. PATHWAY

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE

A. IF THERE IS EVIDENCE OF MIGRATION OF HAZARDOUS CONTAMINANTS, ASSIGN MAXIMUM FACTOR SUBSCORE OF <100 POINTS FOR DIRECT EVIDENCE> OR <80 POINTS FOR INDIRECT EVIDENCE>. IF DIRECT EVIDENCE <100> EXISTS THEN PROCEED TO C. IF NO EVIDENCE OR INDIRECT EVIDENCE <LESS THEN 80> EXISTS, PROCEED TO B.
(80)

B. RATE THE MIGRATION POTENTIAL FOR 3 POTENTIAL PATHWAYS: SURFACE WATER MIGRATION, FLOODING, AND GROUND-WATER MIGRATION. SELECT THE HIGHEST RATING, AND PROCEED TO C.

1. SURFACE WATER MIGRATION

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
DISTANCE TO NEAREST SURFACE WATER	:	2	8	16	24
NET PRECIPITATION	:	1	6	6	18
SURFACE EROSION	:	1	8	8	24
SURFACE PERMEABILITY	:	2	6	12	18
RAINFALL INTENSITY	:	2	8	16	24
SUBTOTALS				58	108
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					54

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
2. FLOODING		0	1	0	3
SUBSCORE (100 x FACTOR SCORE /3)	:				0

3. GROUND WATER MIGRATION

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
DEPTH TO GROUND WATER	:	2	8	16	24
NET PRECIPITATION	:	1	6	6	18
SOIL PERMEABILITY	:	1	8	8	24
SUBSURFACE FLOWS	:	0	8	0	24
DIRECT ACCESS TO GROUND WATER	:	0	8	0	24
SUBTOTALS				30	114
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					26

C. HIGHEST PATHWAY SUBSCORE

ENTER THE HIGHEST SUBSCORE VALUE FROM A, B-1, B-2 OR B-3 ABOVE.
(80)

IV. WASTE MANAGEMENT PRACTICES

A. AVERAGE THE THREE SUBSCORES FOR RECEPTORS, WASTE CHARACTERISTICS, AND PATHWAYS.

RECEPTORS	(58)
WASTE CHARACTERISTICS	(40)
PATHWAYS	(80)
TOTAL DIVIDED BY 3 = GROSS TOTAL SCORE	(59)

B. APPLY FACTOR FOR WASTE CONTAINMENT FROM WASTE MANAGEMENT PRACTICES

GROSS TOTAL SCORE x	WASTE MANAGEMENT PRACTICES FACTOR x		FINAL SCORE
(59)(	1)	=	59
			=========

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE SITE NO. 5 - RAMP DRAINAGE DITCH
LOCATION OHIO AIR NATIONAL GUARD, SPRINGFIELD, OHIO
DATE OF OPERATION/OCCURRENCE 1955 TO PRESENT
OWNER/OPERATOR 178TH TACTICAL FIGHTER GROUP
COMMENTS/DESCRIPTION
RATED BY HMTC

I. RECEPTORS

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
A. POPULATION WITHIN 1000 FEET OF SITE	:	3	4	12	12
B. DISTANCE TO NEAREST WELL	:	3	10	30	30
C. LAND USE/ZONING WITHIN 1 MILE RADIUS	:	1	3	3	9
D. DISTANCE TO INSTALLATION BOUNDARY	:	3	6	18	18
E. CRITICAL ENVIRONMENTS WITHIN 1 MILE RADIUS OF SITE	:	0	10	0	30
F. WATER QUALITY OF NEAREST SURFACE WATER	:	0	6	0	18
G. GROUND WATER USE OF UPPERMOST AQUIFER	:	2	9	18	27
H. POPULATION (WITHIN 3 MILES) SERVED BY					
DOWN STREAM SURFACE WATER	:	2	6	12	18
GROUND WATER	:	2	6	12	18
		SUBTOTALS		105	180

RECEPTORS SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL) 58

II. WASTE CHARACTERISTICS

A. SELECT THE FACTOR SCORE BASED ON THE ESTIMATED QUANTITY, THE DEGREE OF HAZARD, AND THE CONFIDENCE LEVEL OF THE INFORMATION.

1. WASTE QUANTITY (S=SMALL, M=MEDIUM, L=LARGE) (S)
2. CONFIDENCE LEVEL (S=SUSPECT, C=CONFIRM) (C)
3. HAZARD RATING (L=LOW, M=MEDIUM, H=HIGH) (M)

FACTOR SUBSCORE A (40)
(FROM 20 TO 100 BASED ON FACTOR SCORE MATRIX)

B. APPLY PERSISTENCE FACTOR

FACTOR SUBSCORE A x PERSISTENCE FACTOR = SUBSCORE B
(40)(0.8) = (32)

C. APPLY PHYSICAL STATE MULTIPLIER

SUBSCORE B x PHYSICAL STATE MULTIPLIER = WASTE CHARACTERISTICS SUBSCORE
(32)(1) = (32)

III. PATHWAY

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE

A. IF THERE IS EVIDENCE OF MIGRATION OF HAZARDOUS CONTAMINANTS, ASSIGN MAXIMUM FACTOR SUBSCORE OF (100 POINTS FOR DIRECT EVIDENCE) OR (80 POINTS FOR INDIRECT EVIDENCE). IF DIRECT EVIDENCE (100) EXISTS THEN PROCEED TO C. IF NO EVIDENCE OR INDIRECT EVIDENCE (LESS THEN 80) EXISTS, PROCEED TO B.

(80)

B. RATE THE MIGRATION POTENTIAL FOR 3 POTENTIAL PATHWAYS: SURFACE WATER MIGRATION, FLOODING, AND GROUND-WATER MIGRATION. SELECT THE HIGHEST RATING, AND PROCEED TO C.

1. SURFACE WATER MIGRATION

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
DISTANCE TO NEAREST SURFACE WATER	:	2	8	16	24
NET PRECIPITATION	:	1	6	6	18
SURFACE EROSION	:	1	8	8	24
SURFACE PERMEABILITY	:	2	6	12	18
RAINFALL INTENSITY	:	2	8	16	24
SUBTOTALS				58	108
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					54

2. FLOODING

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
FLOODING		0	1	0	3
SUBSCORE (100 x FACTOR SCORE /3)	:				0

3. GROUND WATER MIGRATION

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
DEPTH TO GROUND WATER	:	2	8	16	24
NET PRECIPITATION	:	1	6	6	18
SOIL PERMEABILITY	:	1	8	8	24
SUBSURFACE FLOWS	:	0	8	0	24
DIRECT ACCESS TO GROUND WATER	:	0	8	0	24
SUBTOTALS				30	114
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					26

C. HIGHEST PATHWAY SUBSCORE

ENTER THE HIGHEST SUBSCORE VALUE FROM A, B-1, B-2 OR B-3 ABOVE.

(80)

IV. WASTE MANAGEMENT PRACTICES

A. AVERAGE THE THREE SUBSCORES FOR RECEPTORS, WASTE CHARACTERISTICS, AND PATHWAYS.

RECEPTORS	(58)
WASTE CHARACTERISTICS	(32)
PATHWAYS	(80)
TOTAL DIVIDED BY 3 = GROSS TOTAL SCORE	(57)

B. APPLY FACTOR FOR WASTE CONTAINMENT FROM WASTE MANAGEMENT PRACTICES

GROSS TOTAL SCORE x	WASTE MANAGEMENT PRACTICES FACTOR x		FINAL SCORE
(57)	(1)	=	57

=========

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE	SITE NO. 6 - MESS HALL UST OIL SPILL
LOCATION	OHIO AIR NATIONAL GUARD, SPRINGFIELD, OHIO
DATE OF OPERATION/OCCURRENCE	1987
OWNER/OPERATOR	178TH TACTICAL FIGHTER GROUP
COMMENTS/DESCRIPTION	
RATED BY	HMTC

I. RECEPTORS

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
A. POPULATION WITHIN 1000 FEET OF SITE	:	3	4	12	12
B. DISTANCE TO NEAREST WELL	:	3	10	30	30
C. LAND USE/ZONING WITHIN 1 MILE RADIUS	:	1	3	3	9
D. DISTANCE TO INSTALLATION BOUNDARY	:	3	6	18	18
E. CRITICAL ENVIRONMENTS WITHIN 1 MILE RADIUS OF SITE	:	0	10	0	30
F. WATER QUALITY OF NEAREST SURFACE WATER	:	0	6	0	18
G. GROUND WATER USE OF UPPERMOST AQUIFER	:	2	9	18	27
H. POPULATION (WITHIN 3 MILES) SERVED BY					
DOWN STREAM SURFACE WATER	:	2	6	12	18
GROUND WATER	:	2	6	12	18
		SUBTOTALS		105	180

RECEPTORS SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL) 58

II. WASTE CHARACTERISTICS

A. SELECT THE FACTOR SCORE BASED ON THE ESTIMATED QUANTITY, THE DEGREE OF HAZARD, AND THE CONFIDENCE LEVEL OF THE INFORMATION.

1. WASTE QUANTITY (S=SMALL, M=MEDIUM, L=LARGE) (S)
2. CONFIDENCE LEVEL (S=SUSPECT, C=CONFIRM) (C)
3. HAZARD RATING (L=LOW, M=MEDIUM, H=HIGH) (H)

FACTOR SUBSCORE A (50)
(FROM 20 TO 100 BASED ON FACTOR SCORE MATRIX)

B. APPLY PERSISTENCE FACTOR

FACTOR SUBSCORE A x PERSISTENCE FACTOR		=	SUBSCORE B
(50)	(0.8)	=	(40)

C. APPLY PHYSICAL STATE MULTIPLIER

SUBSCORE B x	PHYSICAL STATE MULTIPLIER	=	WASTE CHARACTERISTICS SUBSCORE
(40)	(1)	=	(40)

III. PATHWAY

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE

A. IF THERE IS EVIDENCE OF MIGRATION OF HAZARDOUS CONTAMINANTS, ASSIGN MAXIMUM FACTOR SUBSCORE OF (100 POINTS FOR DIRECT EVIDENCE) OR (80 POINTS FOR INDIRECT EVIDENCE). IF DIRECT EVIDENCE (100) EXISTS THEN PROCEED TO C. IF NO EVIDENCE OR INDIRECT EVIDENCE (LESS THEN 80) EXISTS, PROCEED TO B.

(80)

B. RATE THE MIGRATION POTENTIAL FOR 3 POTENTIAL PATHWAYS: SURFACE WATER MIGRATION, FLOODING, AND GROUND-WATER MIGRATION. SELECT THE HIGHEST RATING, AND PROCEED TO C.

1. SURFACE WATER MIGRATION

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
DISTANCE TO NEAREST SURFACE WATER	:	2	8	16	24
NET PRECIPITATION	:	1	6	6	18
SURFACE EROSION	:	1	8	8	24
SURFACE PERMEABILITY	:	2	6	12	18
RAINFALL INTENSITY	:	2	8	16	24
SUBTOTALS				58	108
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					54

2. FLOODING

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
FLOODING		0	1	0	3
SUBSCORE (100 x FACTOR SCORE /3)	:				0

3. GROUND WATER MIGRATION

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
DEPTH TO GROUND WATER	:	2	8	16	24
NET PRECIPITATION	:	1	6	6	18
SOIL PERMEABILITY	:	1	8	8	24
SUBSURFACE FLOWS	:	0	8	0	24
DIRECT ACCESS TO GROUND WATER	:	0	8	0	24
SUBTOTALS				30	114
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					26

C. HIGHEST PATHWAY SUBSCORE

ENTER THE HIGHEST SUBSCORE VALUE FROM A, B-1, B-2 OR B-3 ABOVE.

(80)

IV. WASTE MANAGEMENT PRACTICES

A. AVERAGE THE THREE SUBSCORES FOR RECEPTORS, WASTE CHARACTERISTICS, AND PATHWAYS.

RECEPTORS	(58)
WASTE CHARACTERISTICS	(40)
PATHWAYS	(80)
TOTAL DIVIDED BY 3 = GROSS TOTAL SCORE	(59)

B. APPLY FACTOR FOR WASTE CONTAINMENT FROM WASTE MANAGEMENT PRACTICES

GROSS TOTAL SCORE x	WASTE MANAGEMENT PRACTICES FACTOR x		FINAL SCORE
(59)	(1)	=	59

=========

HAZARDOUS ASSESSMENT RATING FORM

NAME OF SITE SITE NO. 7 - DIESEL FUEL SPILL
LOCATION OHIO AIR NATIONAL GUARD, SPRINGFIELD, OHIO
DATE OF OPERATION/OCCURRENCE WINTER 1983
OWNER/OPERATOR 178TH TACTICAL FIGHTER GROUP
COMMENTS/DESCRIPTION
RATED BY HMTC

I. RECEPTORS

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
A. POPULATION WITHIN 1000 FEET OF SITE	:	3	4	12	12
B. DISTANCE TO NEAREST WELL	:	2	10	20	30
C. LAND USE/ZONING WITHIN 1 MILE RADIUS	:	3	3	9	9
D. DISTANCE TO INSTALLATION BOUNDARY	:	3	6	18	18
E. CRITICAL ENVIRONMENTS WITHIN 1 MILE RADIUS OF SITE	:	0	10	0	30
F. WATER QUALITY OF NEAREST SURFACE WATER	:	1	6	6	18
G. GROUND WATER USE OF UPPERMOST AQUIFER	:	0	9	0	27
H. POPULATION (WITHIN 3 MILES) SERVED BY					
DOWN STREAM SURFACE WATER	:	3	6	18	18
GROUND WATER	:	0	6	0	18
		SUBTOTALS		83	180

RECEPTORS SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL) 46

II. WASTE CHARACTERISTICS

A. SELECT THE FACTOR SCORE BASED ON THE ESTIMATED QUANTITY, THE DEGREE OF HAZARD, AND THE CONFIDENCE LEVEL OF THE INFORMATION.

1. WASTE QUANTITY (S=SMALL, M=MEDIUM, L=LARGE) (S)
2. CONFIDENCE LEVEL (S=SUSPECT, C=CONFIRM) (C)
3. HAZARD RATING (L=LOW, M=MEDIUM, H=HIGH) (H)

FACTOR SUBSCORE A (50)
(FROM 20 TO 100 BASED ON FACTOR SCORE MATRIX)

B. APPLY PERSISTENCE FACTOR

FACTOR SUBSCORE A x PERSISTENCE FACTOR = SUBSCORE B
(50)(0.8) = (40)

C. APPLY PHYSICAL STATE MULTIPLIER

SUBSCORE B x PHYSICAL STATE MULTIPLIER = WASTE CHARACTERISTICS SUBSCORE
(40)(1) = (40)

III. PATHWAY

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE

A. IF THERE IS EVIDENCE OF MIGRATION OF HAZARDOUS CONTAMINANTS, ASSIGN MAXIMUM FACTOR SUBSCORE OF (100 POINTS FOR DIRECT EVIDENCE) OR (80 POINTS FOR INDIRECT EVIDENCE). IF DIRECT EVIDENCE (100) EXISTS THEN PROCEED TO C. IF NO EVIDENCE OR INDIRECT EVIDENCE (LESS THEN 80) EXISTS, PROCEED TO B.
(80)

B. RATE THE MIGRATION POTENTIAL FOR 3 POTENTIAL PATHWAYS: SURFACE WATER MIGRATION, FLOODING, AND GROUND-WATER MIGRATION. SELECT THE HIGHEST RATING, AND PROCEED TO C.

1. SURFACE WATER MIGRATION

DISTANCE TO NEAREST SURFACE WATER	:	3	8	24	24
NET PRECIPITATION	:	1	6	6	18
SURFACE EROSION	:	1	8	8	24
SURFACE PERMEABILITY	:	1	6	6	18
RAINFALL INTENSITY	:	1	8	8	24
SUBTOTALS				52	108
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					48

2. FLOODING — 0 — 1 — 0 — 3

SUBSCORE (100 x FACTOR SCORE /3) : 0

3. GROUND WATER MIGRATION

DEPTH TO GROUND WATER	:	2	8	16	24
NET PRECIPITATION	:	1	6	6	18
SOIL PERMEABILITY	:	1	8	8	24
SUBSURFACE FLOWS	:	0	8	0	24
DIRECT ACCESS TO GROUND WATER	:	0	8	0	24
SUBTOTALS				30	114
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					26

C. HIGHEST PATHWAY SUBSCORE

ENTER THE HIGHEST SUBSCORE VALUE FROM A, B-1, B-2 OR B-3 ABOVE.
(80)

IV. WASTE MANAGEMENT PRACTICES

A. AVERAGE THE THREE SUBSCORES FOR RECEPTORS, WASTE CHARACTERISTICS, AND PATHWAYS.

RECEPTORS	(45)
WASTE CHARACTERISTICS	(40)
PATHWAYS	(80)
TOTAL DIVIDED BY 3 = GROSS TOTAL SCORE	(55)

B. APPLY FACTOR FOR WASTE CONTAINMENT FROM WASTE MANAGEMENT PRACTICES

GROSS TOTAL SCORE x	WASTE MANAGEMENT PRACTICES FACTOR x		FINAL SCORE
(55)	(1)	=	55

=========

NAME OF SITE SITE NO. 8 - LEACH FIELD
LOCATION OHIO AIR NATIONAL GUARD, SPRINGFIELD, OHIO
DATE OF OPERATION/OCCURRENCE 1960 TO PRESENT
OWNER/OPERATOR 178TH TACTICAL FIGHTER GROUP
COMMENTS/DESCRIPTION
RATED BY HMTC

I. RECEPTORS

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE
A. POPULATION WITHIN 1000 FEET OF SITE	:	3	4	12	12
B. DISTANCE TO NEAREST WELL	:	2	10	20	30
C. LAND USE/ZONING WITHIN 1 MILE RADIUS	:	3	3	9	9
D. DISTANCE TO INSTALLATION BOUNDARY	:	3	6	18	18
E. CRITICAL ENVIRONMENTS WITHIN 1 MILE RADIUS OF SITE	:	0	10	0	30
F. WATER QUALITY OF NEAREST SURFACE WATER	:	1	6	6	18
G. GROUND WATER USE OF UPPERMOST AQUIFER	:	0	9	0	27
H. POPULATION (WITHIN 3 MILES) SERVED BY					
DOWN STREAM SURFACE WATER	:	3	6	18	18
GROUND WATER	:	0	6	0	18
		SUBTOTALS		83	180

RECEPTORS SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL) 46

II. WASTE CHARACTERISTICS

A. SELECT THE FACTOR SCORE BASED ON THE ESTIMATED QUANTITY, THE DEGREE OF HAZARD, AND THE CONFIDENCE LEVEL OF THE INFORMATION.

1. WASTE QUANTITY (S=SMALL, M=MEDIUM, L=LARGE) (S)
2. CONFIDENCE LEVEL (S=SUSPECT, C=CONFIRM) (C)
3. HAZARD RATING (L=LOW, M=MEDIUM, H=HIGH) (M)

FACTOR SUBSCORE A (40)
(FROM 20 TO 100 BASED ON FACTOR SCORE MATRIX)

B. APPLY PERSISTENCE FACTOR

FACTOR SUBSCORE A x PERSISTENCE FACTOR = SUBSCORE B
(40)(0.8) = (32)

C. APPLY PHYSICAL STATE MULTIPLIER

SUBSCORE B x PHYSICAL STATE MULTIPLIER = WASTE CHARACTERISTICS SUBSCORE
(32)(1) = (32)

III. PATHWAY

RATING FACTOR		FACTOR RATING	MULTIPLIER	FACTOR SCORE	MAXIMUM POSSIBLE SCORE

A. IF THERE IS EVIDENCE OF MIGRATION OF HAZARDOUS CONTAMINANTS, ASSIGN MAXIMUM FACTOR SUBSCORE OF <100 POINTS FOR DIRECT EVIDENCE> OR <80 POINTS FOR INDIRECT EVIDENCE>. IF DIRECT EVIDENCE <100> EXISTS THEN PROCEED TO C. IF NO EVIDENCE OR INDIRECT EVIDENCE <LESS THEN 80> EXISTS, PROCEED TO B.
(80)

B. RATE THE MIGRATION POTENTIAL FOR 3 POTENTIAL PATHWAYS: SURFACE WATER MIGRATION, FLOODING, AND GROUND-WATER MIGRATION. SELECT THE HIGHEST RATING, AND PROCEED TO C.

1. SURFACE WATER MIGRATION

DISTANCE TO NEAREST SURFACE WATER	:	3	8	24	24
NET PRECIPITATION	:	1	6	6	18
SURFACE EROSION	:	1	8	8	24
SURFACE PERMEABILITY	:	1	6	6	18
RAINFALL INTENSITY	:	1	8	8	24
SUBTOTALS				52	108
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					48

2. FLOODING		0	1	0	3
SUBSCORE (100 x FACTOR SCORE /3)	:				0

3. GROUND WATER MIGRATION

DEPTH TO GROUND WATER	:	2	8	16	24
NET PRECIPITATION	:	1	6	6	18
SOIL PERMEABILITY	:	1	8	8	24
SUBSURFACE FLOWS	:	0	8	0	24
DIRECT ACCESS TO GROUND WATER	:	0	8	0	24
SUBTOTALS				30	114
SUBSCORE (100 x FACTOR SCORE SUBTOTAL/MAXIMUM SCORE SUBTOTAL)					26

C. HIGHEST PATHWAY SUBSCORE

ENTER THE HIGHEST SUBSCORE VALUE FROM A, B-1, B-2 OR B-3 ABOVE.
(80)

IV. WASTE MANAGEMENT PRACTICES

A. AVERAGE THE THREE SUBSCORES FOR RECEPTORS, WASTE CHARACTERISTICS, AND PATHWAYS.

RECEPTORS	(46)
WASTE CHARACTERISTICS	(32)
PATHWAYS	(80)
TOTAL DIVIDED BY 3 = GROSS TOTAL SCORE	(53)

B. APPLY FACTOR FOR WASTE CONTAINMENT FROM WASTE MANAGEMENT PRACTICES

GROSS TOTAL SCORE x	WASTE MANAGEMENT PRACTICES FACTOR x	FINAL SCORE
(53)	(1)	= 53

APPENDIX E

Underground Storage Tank Inventory

Underground Storage Tank Inventory: Springfield Ohio Air National Guard,
Springfield-Beckley Municipal Airport, Springfield, Ohio

Location	POL	POL	POL	POL	Motor Pool	Motor Pool	Motor Pool	269 Comm Bldg.	AGE Shop
Capacity (gallons)	25,000	25,000	25,000	25,000	10,000	2,000	4,000	4,000	4,000
Contents	JP-4	JP-4	JP-4	JP-4	leaded gas	unleaded gas	diesel fuel	heating oil	heating oil
Year Installed	1951	1951	1951	1951	1956	1976	1956	1970	1972
Material of Construction	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel
Coatings A. Interior B. Exterior	A. unlined B. coated	A. unlined B. coated	A. unlined B. coated	A. unlined B. coated	A. unlined B. coated	A. unlined B. coated	A. unlined B. coated	A. unlined B. coated	A. unlined B. coated
Cathodic Protection	yes	yes	yes	yes	no	no	no	no	no
Status of Tank (year abandoned)	in use	in use	in use	in use	in use	in use	in use	in use	in use

Underground Storage Tank Inventory: Springfield Ohio Air National Guard, Springfield-Beckley Municipal Airport, Springfield, Ohio (Continued)

Location	251 HQ Bldg.	Hanger	Hanger	Dining Hall	Control Tower	Ops Bldg.	Fire Station	Fuel Cell	Avionics Bldg.
Capacity (gallons)	4,000	15,000	20,000	1,000	275	10,000	3,000	5,000	4,000
Contents	Heating oil	Heating oil	Heating oil	Heating oil	Heating oil	Heating oil	Heating oil	Heating oil	Heating oil
Year Installed	1971	1968	1976	1987	1961	1978	1977	1981	1979
Material of Construction	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel	Steel
Coatings A. Interior B. Exterior	A. unlined B. coated	A. unlined B. coated	A. unlined B. coated	A. unlined B. coated	A. unlined B. coated	A. unlined B. coated	A. unlined B. coated	A. unlined B. coated	A. unlined B. coated
Cathodic Protection	no	no	no	no	no	no	no	no	no
Status of Tank (year abandoned)	in use	in use	in use	in use	in use	in use	in use	in use	in use

Underground Storage Tank Inventory: Blue Ash Ohio Air National Guard, Blue Ash Air National Guard Station, Cincinnati, Ohio

Location	Motor Pool	AGE Shop	Motor Pool	Motor Pool
Capacity (gallons)	500	500	2,000	500
Contents	waste	waste	fuel oil	waste
Year Installed	1985	1972	1985	1981
Material of Construction	steel	steel	steel	steel
Coatings A. Interior B. Exterior	A. unlined B. coated	A. unlined B. coated	A. unlined B. coated	A. unlined B. coated
Cathodic Protection	no	no	no	no
Status of Tank (year abandoned)	in use	1987	in use	in use